



Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

❖ Approved by AICTE ❖ ISO 21001:2018 Certified

Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA

Phone No. +91 8645 - 350 200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

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To
The Addl. Dean-Academics
K L Deemed University
Vaddeswaram

Dear Sir,

Sub: Minutes of the KLEF/BT/XXXXII BOS meeting-Biotechnology-held on 12/08/2025 in offline mode from 04:30 pm to 05:30 pm Reg.,

We, the Department of Biotechnology have organized BOS meeting for the Academic Year 2025-2026 in which we have recommended Y25 curriculum to the Academic council. Suggestions were received from various stakeholders (Alumni, Parents, Students, Industry peers, Employee peers and Academic peers) and the same were incorporated in the Y25 curriculum for both UG and PG programs.

In this context, we would like to submit the BOS meeting minutes and an action taken report from our end.

Thanking You,

Yours sincerely

Dr. V PRAVEEN KUMAR
BOS Chairman - BT

Head 18/8/25
Department of Biotechnology
Koneru Lakshmaiah Education Foundation
(Deemed to be University)
VADDESWAREM, Guntur Dt.

18/8/25
PRINCIPAL
College of Engineering
Koneru Lakshmaiah Education Foundation
(Deemed to be University)
Green Fields, VADDESWAREM-522 302
Guntur District, Andhra Pradesh.



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Date: 12/08/2025

DEPARTMENT OF BIOTECHNOLOGY

MINUTES OF XXXXII BOARD OF STUDIES MEETING

The Department Board of Studies meeting was conducted on **12/08/2025** in offline mode from 04:30 pm to 05:30 pm Dr. V Praveen Kumar, HoD-BT, as a chair.

The following members were present for XXXXII BoS meeting

1. Dr. V Praveen Kumar, Professor, HoD-BT, Chairman
2. Dr. Vishal Mishra, Professor, IIT BHU -External Member
3. Dr. Krishna Reddy, Sr.Scientist, Dr.Reddys Laboratories -Hyderabad -External Member
4. Dr. Parupudi LC Pavani, Specialist MS&T, Novartis India-Hyderabad-Telangana-External Member
5. Dr.BVLS Prasad, Professor-Member
6. Dr.Mohamad Arifullah, Professor-Member
7. Dr.Nadeem Siddiqui, Assoc.Professor-Member
8. Dr.Bandaru Srinivas, Assoc.Professor-Member
9. Dr.Ragini Singh, Assoc.Professor-Member
10. Dr.M.Maheswara Reddy, Asst.Professor-Member
11. Dr.G.Siva Reddy, Asst.Professor-Member
12. Dr.P Rajasekhar, Asst.Professor-Member
13. Dr.C Chandrasekhar, Asst.Professor-Member
14. Dr.Y V Rajesh, Asst.Professor-Member
15. Dr.G Koteswara Reddy, Asst.Professor-Member
16. Dr. B Navyatha, Asst.Professor-Member
17. Dr. T Uday, Asst.Professor-Member
18. Dr.M Nageswara Rao, Asst.Professor-Special Invitee
19. Dr.M Hemalatha, Asst.Professor-Member
20. Dr.Krishna Samantha, Asst.Professor-Member

Member's Absent-NIL

Dr. V Praveen Kumar, Chairman of BoS, started the meeting remarks by welcoming and introducing the external members to the internal and special invite members and thanking them for accepting to become members of the Board of Studies. The chairman put forward the Agenda items before the Board of Studies meeting.


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AGENDA and RESOLUTIONS

AGENDA ITEM-I

To consider and approve the curriculum for the 2025-2026 admitted batch of B.Tech (with various categories of degrees) and M.Tech (Biotechnology).	Approved and recommended to Academic Council
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RESOLUTION: The curriculum for the 2025-2026 admitted batch of B.Tech and M.Tech in Biotechnology has been approved by the BoS members and recommended to the Academic Council. The course structure for the 2025-2026 batch has been furnished in **Annexure I**. The B.Tech program will be offered through various specialized degrees, including Diploma in Biotechnology, B.Sc. in Biotechnology, B.Tech with Minor Degree, B.Tech with Double Major, B.Tech with Specialization, B.Tech (No Flexibility, No Add-on), B.Tech (Honors), B.Tech (Honors) with Specialization, B.Tech (Honors) with Minor, B.Tech (Honors) with Double Major, B.Tech (Honors through Research), B.Tech (Honors through Research) with Specialization, B.Tech (Honors through Research) with Minor, B.Tech (Honors through Research) with Double Major, B.Tech (Honors through Innovation), B.Tech (Honors through Innovation) with Minor, B.Tech (Honors through Innovation) with Double Major, B.Tech (Honors through Innovation) with Specialization, B.Tech (Honors through Experiential Learning), B.Tech (Honors through Experiential Learning) with Minor, B.Tech (Honors through Experiential Learning) with Double Major, and B.Tech (Honors through Experiential Learning) with Specialization.

AGENDA ITEM-II

To consider and approve the resolutions made by XXXXII DAC conducted on 05 th August 2025.	Approved and recommended to Academic Council
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RESOLUTION: The points discussed in the DAC meeting were approved by BoS members and recommended to Academic council. DAC minutes and proofs are mentioned in (**Annexure: II**).


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AGENDA ITEM-III

To consider and approve the pre-Ph.D courses for the December-2024 & June-2025 admitted batches of Ph.D.

Approved and
recommended to
Academic Council

RESOLUTION: Pre Ph.D courses and syllabi for the December-2024 & June-2025 admitted batches of Ph.D have been approved by BoS members and recommended to the Academic Council and the corresponding proofs have been attached in **Annexure -III**.

AGENDA ITEM-IV

To consider and approve the change in the L-T-P-S structure of skill courses offered for the 2024-2025 and 2025-2026 admitted batches, from 0-0-2-4 to 1-0-0-4.

Approved and
recommended to
Academic Council

RESOLUTION: The change in the L-T-P-S structure of the Skill Development courses from 0-0-2-4 to 1-0-0-4 for the 2024-2025 admitted batch has been approved by the BOS members and recommended to the Academic Council for further approval. The corresponding course structure has been attached as **Annexure-IV**.

AGENDA ITEM-V

To consider and approve the feedback from stakeholders regarding 2025-2026 batch of admitted students.

Approved and
recommended to
Academic Council

RESOLUTION: Feedback from stakeholders regarding the upcoming 2025-2026 batch has been approved by BoS members and recommended to the Academic Council. Action Taken Report has been attached as **Annexure-V**.


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AGENDA ITEM-VI

To consider and approve the revisions proposed by the course coordinators in syllabus / Course Outcomes /experiments / teaching pedagogies for the courses to be offered in 2025-2026 academic year.	Approved and recommended to Academic Council
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RESOLUTION: The revisions proposed by the stakeholders and course coordinators in the syllabus, Course Outcomes, experiments, and teaching pedagogies for the courses to be offered to the 2024–2025 and 2023–2024 admitted batches have been approved by the BoS members and recommended to the Academic Council for further approval. The syllabi for the 2024–2025 and 2023–2024 batches have been furnished in **Annexure VI**.

AGENDA ITEM-VII

To consider and approve the program development document (M.Tech and B.Tech) of the new program structure, highlighting local, regional, national, and global needs, and mapping them to the courses.	Approved and recommended to Academic Council
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RESOLUTION: The Board of Studies (BoS) resolved to approve the Program Development Document (PDD) for both M.Tech and B.Tech programs, which includes the new program structure aligned with Local, Regional, National, and Global needs, along with appropriate course mappings. The PDD reflects the academic and industry relevance of the revised curriculum and ensures outcome-based education aligned with current and future trends. The BoS recommends the approved PDD to the Academic Council for further consideration and implementation. The Program Development Document for the 2025–2026 admitted batch has been furnished in **Annexure-VII**.

AGENDA ITEM-VIII

To consider the approval of proposal for launching certificate courses for 2025-2026 admitted batch.	Approved and recommended to Academic Council
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RESOLUTION: The Board of Studies (BoS) resolved to introduce, approve, and recommend the following Value Added Courses for the 2025–2026 admitted batch to the Academic Council for further approval. These courses are designed to enhance students' interdisciplinary knowledge and employability in emerging and industry-relevant domains. The approved courses are:

1. Nano Medicine
2. Clinical Data Management
3. Pharmacovigilance
4. Regulatory Affairs
5. Base SAS
6. NGS Sequencing
7. Medical Coding
8. Clinical Trials
9. Six Sigma

AGENDA ITEM-IX

To consider and approve the list of double major courses introduced for the 2025-2026 admitted batches of other engineering departments such as AI&DS, CSE, CS&IT, ECE, EEE, ME, CE, and IOT.	Approved and recommended to Academic Council
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RESOLUTION: Upon discussion, all BOS members approved the incorporation of the following courses into the curriculum for students opting for a double major degree in Biotechnology for the Academic Year 2025–2026. This inclusion aims to enhance the employability of students across various interdisciplinary streams and job opportunities. For the Academic Year 2025–2026, these courses will also be made available to students from other engineering departments such as AI&DS, CSE, CS&IT, ECE, EEE, ME, CE, and IOT.

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The list of courses under the double major degree is as follows:

S. No	CATEGORY	NPTEL-DOMAIN NAME	Course Title	L	T	P	S	Cr	CH
1	DOUBLE MAJOR	BIOPROCESSES	PRINCIPLES OF DOWNSTREAM TECHNIQUES IN BIOPROCESS	2	2	0	0	4	0
2	DOUBLE MAJOR	BIOPROCESSES	MATERIAL AND ENERGY BALANCES	2	2	0	0	4	0
3	DOUBLE MAJOR	BIOPROCESSES	ASPECTS OF BIOCHEMICAL ENGINEERING	2	2	0	0	4	0
4	DOUBLE MAJOR	BIOPROCESSES	BIOENERGY	2	2	0	0	4	0
5	DOUBLE MAJOR	BIOPROCESSES	EXPERIMENTAL BIOLOGY	2	2	0	0	4	0
6	DOUBLE MAJOR	BIOENGINEERING	BIOENGINEERING: AN INTERFACE WITH BIOLOGY AND MEDICINE	2	2	0	0	4	0
7	DOUBLE MAJOR	BIOENGINEERING	CELL CULTURE TECHNOLOGIES	2	2	0	0	4	0
8	DOUBLE MAJOR	BIOENGINEERING	MEDICAL BIOMATERIALS	2	2	0	0	4	0
9	DOUBLE MAJOR	BIOENGINEERING	BIOINTERFACE ENGINEERING	2	2	0	0	4	0
10	DOUBLE MAJOR	BIOENGINEERING	BIOMEDICAL NANOTECHNOLOGY	2	2	0	0	4	0
11	DOUBLE MAJOR	BIOENGINEERING	DRUG DELIVERY: PRINCIPLES AND ENGINEERING	2	2	0	0	4	0
12	DOUBLE MAJOR	BIOSCIENCES	STRUCTURAL BIOLOGY	2	2	0	0	4	0
13	DOUBLE MAJOR	BIOSCIENCES	MOLECULAR BIOLOGY	2	2	0	0	4	0
14	DOUBLE MAJOR	BIOSCIENCES	ADVANCES IN OMICS	2	2	0	0	4	0
15	DOUBLE MAJOR	BIOSCIENCES	EXPERIMENTAL BIOCHEMISTRY	2	2	0	0	4	0
16	DOUBLE MAJOR	BIOSCIENCES	PLANT DEVELOPMENTAL BIOLOGY	2	2	0	0	4	0

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AGENDA ITEM-X

To consider and approve the courses offered for the Honors, Honors Through Innovation (HTI), Honors Through Experiential Learning (HTE), and Honors Through Research (HTR) tracks for the 2025–2026 admitted batch.

Approved and
recommended to
Academic Council

RESOLUTION: The committee has reviewed and considered the courses offered for the Honors, Honors Through Innovation (HTI), Honors Through Experiential Learning (HTE), and Honors Through Research (HTR) tracks for the 2025–2026 admitted batch. After thorough evaluation, the BoS members approved and recommended the courses to the Academic Council; the detailed courses are attached in **Annexure-VIII**.


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The following members have attended the XXXXII Board of studies (BOS) meeting held on 12/08/2025 in offline mode from 04:30 pm to 05:30 pm

S.No	FULL NAME	DESIGNATION	ORGANIZATION	POSITION IN THE MEETING	SIGNATURE
1	Dr.V.Praveen Kumar	Professor & HOD	K L E F- Biotechnology	Chairman	
2	Dr. C Chandrasekhar	Alternate Head & Asst. Professor	K L E F- Biotechnology	Secretary	
2	Dr.BVLS Prasad	Professor	K L E F- Biotechnology	Internal member	
3	Dr.Mohammed Arifullah	Professor	K L E F- Biotechnology	Internal member	
4	Dr.Nadeem Siddiqui	Assoc. Professor	K L E F- Biotechnology	Internal member	
5	Dr.Bandaru Srinivas	Assoc. Professor	K L E F- Biotechnology	Special Invitee	
6	Dr.Ragini Singh	Assoc. Professor	K L E F- Biotechnology	Internal member	
7	Dr.M.Maheswara Reddy	Asst. Professor	K L E F- Biotechnology	Internal member	
8	Dr.G.Siva Reddy	Asst. Professor- Professor incharge Academics	K L E F- Biotechnology	Internal member	
9	Dr.Y V Rajesh	Asst. Professor-R Pac chairman	K L E F- Biotechnology	Internal member	
10	Dr.P Rajasekhar	Asst. Professor	K L E F- Biotechnology	Internal member	
11	Dr. G Koteswara Reddy	Asst. Professor	K L E F- Biotechnology	Internal member	



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12	Dr.T Uday	Asst. Professor	K L E F- Biotechnology	Internal member	<i>T. Uday</i>
13	Dr.M Nageswara Rao	Asst.Professor	K L E F- Biotechnology	Internal member	<i>Nageswara</i>
14	Dr.B Navatha	Asst.Professor	K L E F- Biotechnology	Special Invitee	<i>Navatha</i>
15	Dr.M Hemalatha	Asst.Professor	K L E F- Biotechnology	Special Invitee	<i>Hema</i>
16	Dr.Krishna Samantha	Asst.Professor	K L E F- Biotechnology	Special Invitee	<i>Santha</i>
16	Dr. Krishna Reddy	Sr.Scientist	Dr.Reddys Laboratories - Hyderabad	External	<i>Krishna</i>
17	Dr.Vishal Mishra	Professor	IIT BHU	External	<i>Mishra</i>
18	Dr. Parupudi LC Pavani	Specialist MS&T	Novartis India, Hyderabad, Telangana	External	<i>Pavani</i>
19	Ms.T Bhavana	Research Assistant	Medical College of Wisconsin, USA	External	<i>Bhavana</i>


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	Course Category	Course Code	Course Name	L		T	P	S	CH	CR	Pre-requisite	New Course/ Revised Course/ Retained Course	Changes Proposed by	Focused on Employability/ Entrepreneurship/ Skill Development
1	BSC	25MT1001	LINEAR ALGEBRA AND CALCULUS FOR ENGINEERS	2		2	0	0	4	4		RETAINED COURSE		
2	BSC	25MT2003	MATHEMATICAL MODELLING & NUMERICAL METHODS	2		2	0	0	4	4		RETAINED COURSE		
3	BSC	25MT2009	BIOSTATISTICS	2		2	0	0	4	4	25MT2003	RETAINED COURSE		EMPLOYABILITY
4	BSC	25BT1101	CELL BIOLOGY	3		0	0	0	3	3		RETAINED COURSE		
5	BSC	25BT2206	MOLECULAR BIOLOGY	3		0	0	0	3	3		RETAINED COURSE		EMPLOYABILITY
6	BSC	25PH1005	SCIENCE ELECTIVE -1 (PHYSICS)	3		0	2	0	4	5		RETAINED COURSE		
7	BSC	25CY1001	SCIENCE ELECTIVE -2 (CHEMISTRY)	3		0	2	0	4	5		RETAINED COURSE		
8	ESC	25BT2105	PROCESS ENGINEERING PRINCIPLES	3		0	2	0	4	5		RETAINED COURSE		SKILL DEVELOPMENT
9	ESC	25BT1202	BIOCHEMICAL THERMODYNAMICS	3		1	0	0	4	4	25PH1005	RETAINED COURSE		
10	ESC	25BT3112	TRANSPORT PROCESS IN BIOLOGICAL SYSTEMS	3		0	2	0	4	5		REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
11	ESC	25SC1101	PROBLEM SOLVING THROUGH C	3		0	2	4	5	9		RETAINED COURSE		
12	ESC	25SC1203	DATA STRUCTURES	3		0	2	4	5	9		RETAINED COURSE		SKILL DEVELOPMENT
13	ESC	25ME1103	DESIGN TOOLS WORKSHOP	0		0	4	0	2	4		RETAINED COURSE		



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14	ESC	25SC2006	OBJECT ORIENTED PROGRAMMING	3		0	2	2	4.5	7		RETAINED COURSE		SKILL DEVELOPMENT
15	PCC	25BT2103	BIOCHEMISTRY	3		0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
16	PCC	25BT3213	PLANT BIOTECHNOLOGY	3		0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
17	PCC	25BT2104	MICROBIOLOGY	3		0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
18	PCC	25BT2208	BIOANALYTICAL TECHNIQUES	3		0	2	0	4	5	25BT2103	RETAINED COURSE		SKILL DEVELOPMENT
19	PCC	25BT2209	BIOINFORMATICS	3		0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
20	PCC	25BT2207	IMMUNOLOGY	3		0	2	0	4	5	25BT2103	RETAINED COURSE		SKILL DEVELOPMENT
21	PCC	25BT3111	GENETIC ENGINEERING	3		0	2	0	4	5	25BT2206	RETAINED COURSE		SKILL DEVELOPMENT
22	PCC	25BT3110	BIOCHEMICAL REACTION ENGINEERING	3		0	2	0	4	5	25BT2105	REVISED COURSE	INDUSTRY PEERS	SKILL DEVELOPMENT
23	PCC	25BT3214	FERMENTATION TECHNOLOGY	3		0	2	0	4	5	25BT2104	RETAINED COURSE		SKILL DEVELOPMENT
24	PCC	25BT3215	DOWNSTREAM PROCESSING	3		0	2	0	4	5	25BT2208	RETAINED COURSE		SKILL DEVELOPMENT
25	FC-1	25BT2224F	BIOREACTOR OPERATIONS	2		0	2	0	3	4	NIL	REVISED COURSE	ALUMNI	SKILL DEVELOPMENT

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26	FC-1	25BT2239F	COMPUTATIONAL BIOLOGY	2		0	2	0	3	4	NIL	REVISED COURSE	ACDEMIC PEERS	SKILL DEVELOPMENT
27	FC-1	25BT2233F	GENETICS	2		1	0	0	3	3	NIL	RETAINED COURSE		EMPLOYABILITY
28	FC-2	25BT2235F	BIOPROCESS ENGINEERING	2		0	2	0	3	4	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
29	FC-2	25BT2236F	DATA SCIENCE FOR BIOLOGISTS	2		0	2	0	3	4	NIL	RETAINED COURSE		SKILL DEVELOPMENT
30	FC-2	25BT2234F	REGULATORY AFFAIRS AND CLINICAL TRAILS	2		1	0	0	3	3	NIL	RETAINED COURSE		EMPLOYABILITY
31	SDC	25SDBT01	MEDICAL LABORATORY TECHNOLOGY	1		0	0	4	2	5	NIL	REVISED COURSE	INDUSTRY PEERS	SKILL DEVELOPMENT
32	SDC	25SDBT02	PROCESS ENGINEERING TOOLS	1		0	0	4	2	5	NIL	REVISED COURSE	ALUMNI	SKILL DEVELOPMENT
33	SDC	25SDBT03	COMPUTER AIDED DRUG DESIGN	1		0	0	4	2	5	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
34	SDC	25SDBT04	ASPECTS OF BIOCHEMICAL ENGINEERING	1		0	0	4	2	5	NIL	REVISED COURSE	INDUSTRY PEERS	SKILL DEVELOPMENT
35	SDC	25SDBT05	DRUG DESIGN: PRINCIPLES AND ENGINEERING	1		0	0	4	2	5	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
36	SDC	25SDBT06	CELL CULTURE TECHNOLOGIES	1		0	0	4	2	5	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
37	SDC	25SDBT07	MASS SPECTROMETRY BASED PROTEOMICS	1		0	0	4	2	5	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT

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38	SDC	25SDBT08	ANIMAL PHYSIOLOGY	1		0	0	4	2	5	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
39	PRI	25IE2040	SOCIAL INTERNSHIP	0		0	0	4	0	4	NIL	RETAINED COURSE		SKILL DEVELOPMENT
40	PRI	25IE3041	TECHNICAL INTERNSHIP	0		0	0	4	0	4	NIL	RETAINED COURSE		SKILL DEVELOPMENT
41	PRI	25IE4053	ENGINEERING CAPSTONE PROJECT - 1	0		0	8	16	8	12	NIL	RETAINED COURSE		SKILL DEVELOPMENT
42	PRI	25IE4054	ENGINEERING CAPSTONE PROJECT - 2	0		0	8	16	8	12	25IE4053	RETAINED COURSE		SKILL DEVELOPMENT
43	PRI	25IE4051	INTERNSHIP-1	0		0	8	16	8	12	NIL	RETAINED COURSE		SKILL DEVELOPMENT
44	PRI	25IE4052	INTERNSHIP-2	0		0	8	16	8	12	25IE4051	RETAINED COURSE		SKILL DEVELOPMENT
45	PRI	25IE4048	ENGINEERING CAPSTONE	0		0	8	16	8	12	NIL	RETAINED COURSE		SKILL DEVELOPMENT
46	PRI	25IE4042	INTERNSHIP	0		0	8	16	8	12	NIL	RETAINED COURSE		SKILL DEVELOPMENT
47	PEC-1	23BIS3101	MOLECULAR MODELLING AND DRUG DESIGN	3		0	2	0	5	4	25BT2236F	RETAINED COURSE		SKILL DEVELOPMENT
48	PEC-1	23GEG3101	MOLECULAR GENETICS	3		0	2	0	5	4	25BT2233F	RETAINED COURSE		SKILL DEVELOPMENT
49	PEC-1	23HDA3101	INTELLIGENT SYSTEMS FOR DISEASE PREDICTION & DRUG DISCOVERY	3		0	2	0	5	4	25BT2239F	RETAINED COURSE		SKILL DEVELOPMENT



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50	PEC-1	25IBT3101	PHARMACEUTICAL BIOTECHNOLOGY	3		0	2	0	5	4	25BT2224F	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
51	PEC-1	25MBT3101	STEMCELL TECHNOLOGY	3		0	2	0	5	4	25BT2234F	REVISED COURSE	ALUMNI	SKILL DEVELOPMENT
53	PEC-2	25BIS3202	BIOMEDICAL INFORMATICS	3		0	0	0	3	3	25BT2236F	REVISED COURSE	ALUMNI	EMPLOYABILITY
54	PEC-2	23BIS3203	PYTHON AND R PROGRAMMING	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY
55	PEC-2	23GEG3202	MOLECULAR EXPRESSION TECHNOLOGY	3		0	0	0	3	3	25BT2239F	RETAINED COURSE		EMPLOYABILITY
56	PEC-2	23HDA3202	BIO MEDICAL INFORMATICS	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY
57	PEC-2	25HDA3203	GENETIC PROGRAMMING	3		0	0	0	3	3	25BT2234F	REVISED COURSE	ALUMNI	EMPLOYABILITY
58	PEC-2	23HDA3204	PYTHON FOR GENOMIC DATA SCIENCE	3		0	0	0	3	3	25BT2236F	RETAINED COURSE		EMPLOYABILITY
59	PEC-2	23IBT3202	PHARMACOVIGILANCE AND SAFETY	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY
60	PEC-2	25IBT3203	BIOPROCESS ECONOMICS AND PLANT DESIGN	3		0	0	0	3	3	25BT2239F	REVISED COURSE	INDUSTRY PEERS	EMPLOYABILITY
61	PEC-2	23MBT3202	VIROLOGY	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY
62	PEC-2	23MBT3203	NANOBIOTECHNOLOGY	3		0	0	0	3	3	25BT2234F	RETAINED COURSE		EMPLOYABILITY

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63	PEC-3	23BIS3304	STRUCTURAL BIOLOGY	3		0	0	2	5	3.5	25BT2236F	RETAINED COURSE		SKILL DEVELOPMENT
64	PEC-3	23GEG3304	MOLECULAR MARKERS AND DIAGNOSTICS	3		0	0	2	5	3.5	25BT2233F	RETAINED COURSE		SKILL DEVELOPMENT
65	PEC-3	23HDA3305	COMPUTATIONAL NEUROSCIENCE	3		0	0	2	5	3.5	25BT2239F	RETAINED COURSE		SKILL DEVELOPMENT
66	PEC-3	25IBT3304	ENZYME ENGINEERING	3		0	0	2	5	3.5	25BT2224F	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
67	PEC-3	25MBT3304	HEALTHCARE BIOTECHNOLOGY	3		0	0	2	5	3.5	25BT2234F	RETAINED COURSE		SKILL DEVELOPMENT
68	PEC-4	25BIS3405	APPLIED BIOINFORMATICS	3		0	0	0	3	3	25BT2236F	RETAINED COURSE		EMPLOYABILITY
69	PEC-4	25BIS3406	GENOMICS AND PROTEOMICS	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY
70	PEC-4	25GEG3405	DNA FORENSICS	3		0	0	0	3	3	25BT2239F	RETAINED COURSE		EMPLOYABILITY
71	PEC-4	25HDA3406	NGS SEQUENCING AND DATA ANALYSIS	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY
72	PEC-4	25HDA3406	INTRODUCTION TO GENOMIC TECHNOLOGIES	3		0	0	0	3	3	25BT2234F	RETAINED COURSE		EMPLOYABILITY
73	PEC-4	25IBT3405	BIOPROCESS VALIDATION & cGMP	3		0	0	0	3	3	25BT2236F	RETAINED COURSE		EMPLOYABILITY
74	PEC-4	25IBT3406	FOOD TECHNOLOGY	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY

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75	PEC-4	25MBT3405	CANCER BIOLOGY	3		0	0	0	3	3	25BT2239F	RETAINED COURSE		EMPLOYABILITY
76	PEC-4	25MBT3406	NEUROBIOLOGY	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY
77	PEC-5	25BIS3507	SYSTEMS BIOLOGY	3		0	0	0	3	3	25BT2234F	RETAINED COURSE		EMPLOYABILITY
78	PEC-5	25BIS3508	DATABASE MANAGEMENT SYSTEMS FOR BIOLOGISTS	3		0	0	0	3	3	25BT2236F	RETAINED COURSE		EMPLOYABILITY
79	PEC-5	25GEG3507	MICROBIAL GENETICS	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY
80	PEC-5	25GEG3508	GENE AND ENVIRONMENT	3		0	0	0	3	3	25BT2239F	RETAINED COURSE		EMPLOYABILITY
81	PEC-5	25HDA3509	MOLECULAR MODELING AND DRUG DESIGN	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY
82	PEC-5	25HDA3510	GENOMIC DATA SCIENCE & CLUSTERING	3		0	0	0	3	3	25BT2234F	RETAINED COURSE		EMPLOYABILITY
83	PEC-5	25HDA3511	EPI GENETIC CONTROL OF GENE EXPRESSION	3		0	0	0	3	3	25BT2236F	RETAINED COURSE		EMPLOYABILITY
84	PEC-5	25IBT3507	MICROBIAL TECHNOLOGY	3		0	0	0	3	3	25BT2233F	RETAINED COURSE		EMPLOYABILITY
85	PEC-5	25IBT3508	METABOLIC ENGINEERING	3		0	0	0	3	3	25BT2239F	RETAINED COURSE		EMPLOYABILITY
86	PEC-5	25MBT3507	BIOELECTRONICS AND BIOSENSORS	3		0	0	0	3	3	25BT2224F	RETAINED COURSE		EMPLOYABILITY

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87	PEC-5	25MBT3508	TISSUE ENGINEERING	3		0	0	0	3	3	25BT2234F	RETAINED COURSE		EMPLOYABILITY
88	HAS	25UC1203	DESIGN THINKING FOR INNOVATION	0		0	4	0	2	4	NIL	RETAINED COURSE		ENTERPREUNERSHIP
89	HAS	25UC1102	LANGUAGE SKILLS FOR ENGINEERS	0		0	4	0	2	4	NIL	RETAINED COURSE		
90	HAS	25UC1202	COMMUNICATION SKILLS FOR ENGINEERS	0		0	4	0	2	4	NIL	RETAINED COURSE		
91	HAS	25MBXXXX	MANAGEMENT ELECTIVE	3		0	0	0	3	3	NIL	RETAINED COURSE		ENTERPREUNERSHIP
92	HAS	25FLXXXX	FOREIGN LANGUAGE	3		0	0	0	3	3	NIL	RETAINED COURSE		
93	HAS	25UC0026	HUMAN VALUES, GENDER EQUALITY AND PROFESSIONAL ETHICS	2		0	0	0	2	2	NIL	RETAINED COURSE		
94	HAS	25UC0021	SOCIAL IMMERSIVE LEARNING-1	0		0	2	0	1	2	NIL	RETAINED COURSE		
95	HAS	25UC0022	SOCIAL IMMERSIVE LEARNING - 2	0		0	2	0	1	2	NIL	RETAINED COURSE		
96	AUC	25UC0017	INDIAN ANCIENT KNOWLEDGE SYSTEMS : VEDIC MATHEMATICS	2		0	0	0	0	2	NIL	RETAINED COURSE		
97	AUC	25UC0032	INSIGHTS TO SUSTAINABLE DEVELOPMENT GOALS	2		0	0	0	0	2	NIL	NEW COURSE	ACADEMIC PEERS	
98	AUC	25UC0008	INDIAN CONSTITUTION	2		0	0	0	0	2	NIL	RETAINED COURSE		

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99	AUC	25UC0009	ECOLOGY AND ENVIRONMENT	2		0	0	0	0	2	NIL	RETAINED COURSE		
100	AUC	25UC0018	FUNDAMENTALS OF BIOLOGY	3		0	0	0	0	3	NIL	RETAINED COURSE		
101	AUC	25UC0033	FUNDAMENTALS OF MATHEMATICS	3		0	0	0	0	3	NIL	RETAINED COURSE		
102	OEC		OPEN ELECTIVE - 1	3		0	0	0	3	3	NIL	RETAINED COURSE		
103	OEC		OPEN ELECTIVE - 2	3		0	0	0	3	3	NIL	RETAINED COURSE		
104	OEC		OPEN ELECTIVE - 3	3		0	0	0	3	3	NIL	RETAINED COURSE		

Percentage of Syllabus Revision = $20 \times 100 / 104 = 19.23\%$

Percentage of Courses focusing on Employability = $34 \times 100 / 104 = 32.69\%$

Percentage of Courses focusing on Entrepreneurship = $2 \times 100 / 104 = 1.92\%$

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Department of Biotechnology

Course Code: 25SDBT01 Course Title: MEDICAL LABORATORY TECHNOLOGY

L-T-P-S: 1-0-0-4

Course Objective: The objective of this course is to provide students with practical knowledge and hands-on skills essential for working in medical and clinical laboratory settings. It aims to develop competencies in laboratory techniques used for the diagnosis, monitoring, and study of diseases, aligning with industry standards and healthcare needs.

Course Rationale: The Medical Laboratory Technology (MLT) Laboratory course is designed to provide students with the essential hands-on skills and practical knowledge required to perform a wide range of diagnostic laboratory tests. As laboratory investigations are fundamental to clinical decision-making, this course bridges the gap between theoretical understanding and clinical application by training students in the proper handling of biological specimens, operation of laboratory instruments, adherence to safety protocols, and accurate interpretation of results.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Medical Lab Technology: Laboratory Equipment and Materials, Hematology: Red and White Blood Cell Morphology, Techniques for blood collection and handling, blood smear preparation, and analysis, Blood disorder Anemias, Leukemia, Hemostasis and Coagulation Disorders. Separation of serum and plasma from the given blood sample, Blood Sample Collection and Preservation, determining hemoglobin content in the blood sample. Determining total number of red blood cells and white blood cells present in the blood specimen, Bacterial Culture and Identification Identification of viral and Fungal Infections. Immunology and Serology: Antibody-Antigen Interactions. Immunological Techniques and Applications, Serological Tests for Infectious Diseases. Separation of Lymphocytes from Peripheral Blood by Ficoll Method, Erythrocyte sedimentation Rate (ESR).	Introduction to Medical Lab Technology: Laboratory Equipment and Materials, Hematology: Red and White Blood Cell Morphology, Techniques for blood collection and handling, blood smear preparation, and analysis, Blood disorder Anemias, Leukemia, Hemostasis and Coagulation Disorders. Separation of serum and plasma from the given blood sample, Blood Sample Collection and Preservation, determining hemoglobin content in the blood sample. Determining total number of red blood cells and white blood cells present in the blood specimen, Bacterial Culture and Identification Identification of viral and Fungal Infections. Immunology and Serology: Antibody-Antigen Interactions. Immunological Techniques and Applications, Serological Tests for Infectious Diseases. Separation of Lymphocytes from Peripheral Blood by Ficoll Method, Erythrocyte sedimentation Rate (ESR), ABO Blood Grouping Test, WIDAL TEST, Clotting Time Test, Estimate the levels of glucose in the blood sample using a glucose meter.

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Department of Biotechnology

Course Code: 25SDBT02 Course Title: PROCESS ENGINEERING TOOLS L-T-P-S: 1-0-0-4

Course Objective: students will be equipped with the knowledge and skills required to excel in bioprocess engineering within the biotechnology field, as well as to contribute to the development and optimization of bioprocesses that drive innovation and advancements in biopharmaceuticals, biofuels, and other bioproducts.

Course Rationale: Process Engineering Tools for Biotechnology Students" is designed to fulfill the growing demand for skilled professionals who can navigate the intricacies of bioprocess engineering. By providing a comprehensive understanding of bioprocess fundamentals, design principles, and real-world applications, the course prepares students to make meaningful contributions to the biotechnology industry and address global challenges through innovative bioprocess solutions

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Isolation and Screening of Biosurfactant-Producing Bacteria- Introduction to biosurfactants and their role in hydrocarbon bioremediation and plant probiotics, Collection and preparation of hydrocarbon-contaminated soil samples, Techniques for isolating biosurfactant-producing bacteria: Enrichment culture method, Serial dilution and spread plate techniques, Screening methods for biosurfactant production: Hemolytic activity, Oil spreading assay, Emulsification index (E24). Purification and Quantification of Biosurfactants- Extraction of biosurfactants from culture supernatants: Acid precipitation, Solvent extraction (chloroform/methanol), Purification techniques, Thin-layer chromatography (TLC), Column chromatography, Quantification of biosurfactants: Measuring surface tension reduction, Quantitative assays: Drop-collapse method, CTAB agar test. Preparation of medium for bacterial culture, Isolation of microorganism from contaminated soil, BIOCHEMICAL CHARACTERIZATION OF ISOLATED BACTERIA- Catalase test, Citrate test, Coagulase test, DNase TEST, Hippurate test, hydrogen Sulfide production, indole test, method of kovac's reagent, lecithinase test, mixed acid fermentation, oxidase test, potassium hydroxide test, urease test, voes-proskauer test, MICROBIAL KINETICS-construction of growth curve and estimation of growth kinetic parameters and Monod constant from isolated bacterial culture, OPTIMIZATION OF ISOLATED BACTERIAL CULTURE- Plackett - Burman and central composite design, STABILITY STUDIES OF ISOLATED BACTERIAL CULTURE- Temperature stability, pH stability and effect of substrate concentration.	Isolation and Screening of Biosurfactant-Producing Bacteria- Introduction to biosurfactants and their role in hydrocarbon bioremediation and plant probiotics, Collection and preparation of hydrocarbon-contaminated soil samples, Techniques for isolating biosurfactant-producing bacteria: Enrichment culture method, Serial dilution and spread plate techniques, Screening methods for biosurfactant production: Hemolytic activity, Oil spreading assay, Emulsification index (E24). Purification and Quantification of Biosurfactants- Extraction of biosurfactants from culture supernatants: Acid precipitation, Solvent extraction (chloroform/methanol), Purification techniques, Thin-layer chromatography (TLC), Column chromatography, Quantification of biosurfactants: Measuring surface tension reduction, Quantitative assays: Drop-collapse method, CTAB agar test. Characterization of Biosurfactants and Bacterial Strains- Chemical characterization of biosurfactants: FTIR (Fourier Transform Infrared Spectroscopy), NMR (Nuclear Magnetic Resonance), GC-MS (Gas Chromatography-Mass Spectrometry), Molecular identification of biosurfactant-producing bacteria, 16S rRNA sequencing for taxonomic classification, Phylogenetic analysis of isolated strains, Evaluation of biosurfactant stability: Thermal stability, pH and salinity tolerance. Production Optimization and Application in Plant Probiotics- Optimization of biosurfactant production using response surface methodology (RSM): Factors: pH, temperature, carbon source, nitrogen source, Scale-up of biosurfactant production in bioreactors, Application of biosurfactants in enhancing plant growth: Role of biosurfactant-producing bacteria as plant probiotics. Biofilm formation, root colonization, and nutrient uptake enhancement in plants, Field trials: Impact of biosurfactant-producing bacteria on plant health and soil remediation.

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Department of Biotechnology

Course Code: 25SDBT03 Course Title: COMPUTER AIDED DRUG DESIGN L-T-P-S: 1-0-0-4

Course Objective: The objective of this course is to introduce students to computational approaches used in modern drug discovery. It aims to develop an understanding of molecular modelling, visualization, and theoretical methods for predicting the properties of drug candidates. Students will learn how computational tools support the design and optimization of new therapeutic compounds, enhancing the efficiency of the drug development process.

Course Rationale: Computational modelling aids drug design by predicting molecular and biological properties. It uses 3D visualization and theoretical methods to support the discovery and optimization of new therapeutic compounds.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
INTRODUCTION TO COMPUTER-AIDED DRUG DESIGN: Drug- Definition, history, and Types; Overview of Drug Discovery and Development I; Methodologies and Strategies in Molecular Modelling and Drug Design – Structure and ligand-based drug design; Drug Targets in Diseases – Enzymes and Receptors; Phases of Computer-aided drug design (Target and Lead Discovery); Biomolecular interactions; Importance of Molecular Modelling and Drug Design in novel Drug discovery. PREDICTION AND STRUCTURAL ANALYSIS OF MACROMOLECULES: Macromolecular structure databases - Protein Data bank, structural classification of protein; Bioanalytical methods to determine protein structure - X-Ray diffractions, NMR and Cryo-electron methods; Protein Structure and Function-Hierarchy of protein structures, Concept of Protein Folding, Interactions Forces; Protein structure prediction - Concept of protein modelling, structure validation methods; Optimization of protein structure - Preparation and Refinement methods; Introduction to Transmembrane Proteins - Structure, function, and prediction; Mutational Effects on protein structure - Calculation of free energy, Prediction of deleterious mutations BIOMOLECULAR INTERACTIONS AND DRUG DISCOVERY METHODS: Small Molecule Analysis - Structural analysis, Physico-chemical analysis, prediction of ADMET properties and biological activity; Introduction to chemical pharmacophore; Principles of biomolecular interactions - Molecular Docking, Molecular Dynamics simulations, ranking, and scoring; Concepts of Virtual screening in drug discovery; Introduction to Quantitative structure-activity relationships in drug design. APPLICATIONS AND ADVANCEMENTS IN COMPUTER-AIDED DRUG: Drug Target prediction - methods and applications; Introduction to Biological Networks – protein-protein Interaction analysis; Fundamentals of network pharmacology; Principles of Pharmacogenetics; Sequence analysis of biomolecules - Prediction of Protein Parameters, Secondary structure, Hydrophobicity, trafficking, phosphorylation, Disordered regions.	INTRODUCTION TO COMPUTER-AIDED DRUG DESIGN: Drug- Definition, history, and Types; Overview of Drug Discovery and Development I; Methodologies and Strategies in Molecular Modelling and Drug Design – Structure and ligand-based drug design; Drug Targets in Diseases – Enzymes and Receptors; Phases of Computer-aided drug design (Target and Lead Discovery); Biomolecular interactions; Importance of Molecular Modelling and Drug Design in novel Drug discovery. PREDICTION AND STRUCTURAL ANALYSIS OF MACROMOLECULES: Macromolecular structure databases - Protein Data bank, structural classification of protein; Bioanalytical methods to determine protein structure - X-Ray diffractions, NMR and Cryo-electron methods; Protein Structure and Function-Hierarchy of protein structures, Concept of Protein Folding, Interactions Forces; Protein structure prediction - Concept of protein modelling, structure validation methods; Optimization of protein structure - Preparation and Refinement methods; Introduction to Transmembrane Proteins - Structure, function, and prediction; Mutational Effects on protein structure - Calculation of free energy, Prediction of deleterious mutations BIOMOLECULAR INTERACTIONS AND DRUG DISCOVERY METHODS: Small Molecule Analysis - Structural analysis, Physico-chemical analysis, prediction of ADMET properties and biological activity; Introduction to chemical pharmacophore; Principles of biomolecular interactions - Molecular Docking, Molecular Dynamics simulations, ranking, and scoring; Concepts of Virtual screening in drug discovery; Introduction to Quantitative structure-activity relationships in drug design. APPLICATIONS AND ADVANCEMENTS IN COMPUTER-AIDED DRUG: Drug Target prediction - methods and applications; Introduction to Biological Networks – protein-protein Interaction analysis; Fundamentals of network pharmacology; Principles of Pharmacogenetics; Sequence analysis of biomolecules - Prediction of Protein Parameters, Secondary structure, Hydrophobicity, trafficking, phosphorylation, Disordered regions; Advancements in Molecular modelling and drug design - New technologies and innovations in drug design; Application of Computer-aided drug design with real-world examples.

Head
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Department of Biotechnology

Course Code: 25SDBT04 **Course Title:** ASPECTS OF BIOCHEMICAL ENGINEERING **L-T-P-S:** 1-0-0-4

Course Objective: This course provides an understanding of biochemical processes, including enzyme kinetics, microbial growth, and bioreactor design. It focuses on optimizing processes, product recovery, and promoting eco-friendly bioprocessing solutions.

Course Rationale: By bridging biology, chemistry, and engineering, the course equips students to tackle industrial challenges in pharmaceuticals, biofuels, and environmental technologies, emphasizing sustainable and innovative biotechnological solutions.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Biochemical Engineering- Biochemical Engineering Overview: Scope and importance in industrial applications. Basic Cell Biology: Prokaryotic and eukaryotic cells, enzymes, and microbial metabolism. Bioreactor Design and Types: Overview of bioreactors (batch, fed-batch, continuous) and their applications. Stoichiometry of Microbial Growth and Product Formation: Mass balance, energy balance, yield coefficients. Kinetics and Reactor Analysis- Enzyme Kinetics: Michaelis-Menten kinetics, enzyme inhibition, and allosteric regulation. Microbial Growth Kinetics: Monod equation, substrate utilization, and biomass production. Reactor Design for Bioprocesses: Performance equations for batch, continuous stirred tank reactors (CSTR), and plug flow reactors (PFR). Scale-Up Considerations: Criteria for scaling bioprocesses from laboratory to industrial scale. Environmental and Sustainability Aspects in Bioprocessing- Sustainable Bioprocesses: Green chemistry principles, waste reduction, Bioremediation: Microbial degradation of pollutants, environmental biotechnology, Energy Efficiency in Bioprocesses: Reducing energy consumption in large-scale production, Industrial Biotechnology for Sustainability: Biofuels, biodegradable plastics, and renewable materials. Downstream Processing and Product Recovery Introduction to Downstream Processing: Steps in product recovery (cell separation, filtration, centrifugation). Purification Techniques: Chromatography, membrane filtration, crystallization, and precipitation. Product Formulation and Stability: Techniques for ensuring product quality and shelf life. Case Studies in Biochemical Engineering: Industrial examples of biochemical engineering applications (pharmaceuticals, biofuels, enzymes).	Introduction to Biochemical Engineering- Biochemical Engineering Overview: Scope and importance in industrial applications. Basic Cell Biology: Prokaryotic and eukaryotic cells, enzymes, and microbial metabolism. Bioreactor Design and Types: Overview of bioreactors (batch, fed-batch, continuous) and their applications. Stoichiometry of Microbial Growth and Product Formation: Mass balance, energy balance, yield coefficients. Kinetics and Reactor Analysis- Enzyme Kinetics: Michaelis-Menten kinetics, enzyme inhibition, and allosteric regulation. Microbial Growth Kinetics: Monod equation, substrate utilization, and biomass production. Reactor Design for Bioprocesses: Performance equations for batch, continuous stirred tank reactors (CSTR), and plug flow reactors (PFR). Scale-Up Considerations: Criteria for scaling bioprocesses from laboratory to industrial scale. Bioprocess Control and Optimization. Process Control in Biochemical Engineering: Control parameters (pH, temperature, oxygen transfer), sensors, and automation. Fermentation Technology: Batch, fed-batch, and continuous fermentation processes. Optimization of Bioprocesses: Response surface methodology, Design of Experiments (DOE) for process optimization. Bioreactor Sterilization and Contamination Control: Methods for sterilization, contamination risks, and mitigation. Downstream Processing and Product Recovery Introduction to Downstream Processing: Steps in product recovery (cell separation, filtration, centrifugation). Purification Techniques: Chromatography, membrane filtration, crystallization, and precipitation. Product Formulation and Stability: Techniques for ensuring product quality and shelf life. Case Studies in Biochemical Engineering: Industrial examples of biochemical engineering applications (pharmaceuticals, biofuels, enzymes).



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Department of Biotechnology

Course Code: 25SDBT05 Course Title: DRUG DESIGN: PRINCIPLES AND ENGINEERING L-T-P-S: 1-0-0-4

Course Objective: This course provides foundational knowledge of drug discovery, focusing on drug-receptor interactions, computational drug design, and lead optimization, while exploring emerging technologies and ethical considerations in drug development.

Course Rationale: With increasing reliance on advanced technologies in drug discovery, this course prepares students to innovate by combining chemistry, biology, and computational methods, equipping them to address industry challenges and ethical issues in drug design.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Fundamentals of Drug Design- Introduction to Drug Discovery and Development: Overview of drug discovery pipelines, phases, and challenges. Biological Targets for Drug Action: Receptors, enzymes, nucleic acids, and protein targets. Principles of Structure-Activity Relationships (SAR): How chemical structure influences biological activity. Molecular Modelling Tools: Basics of computational drug design, docking, and molecular dynamics simulations. Drug-Receptor Interactions Mechanism of Drug Action: Ligand-receptor binding, affinity, and specificity. Pharmacodynamics and Pharmacokinetics (PK/PD): Absorption, distribution, metabolism, and excretion (ADME). Quantitative Structure-Activity Relationship (QSAR): Mathematical modelling of SAR. Case Studies: Key examples of successful drug-receptor interaction studies. Computational Drug Design and Screening, Introduction to Computer-Aided Drug Design (CADD): Role of computational methods in modern drug discovery. Virtual Screening and High-Throughput Screening: In silico screening techniques for lead discovery. Docking and Scoring Algorithms: Basics of molecular docking and evaluation of binding affinities. De Novo Drug Design: Designing new molecular entities using computational approaches. Emerging Trends and Ethical Considerations- Emerging Drug Discovery Techniques: AI in drug design, CRISPR technology, and personalized medicine. Biopharmaceuticals and Biologics: Designing protein-based drugs, monoclonal antibodies, and gene therapies. Ethics in Drug Design: Regulatory frameworks, clinical trials, and drug safety. Future of Drug Design: Trends in precision medicine, nanotechnology, and sustainable drug development.	Fundamentals of Drug Design- Introduction to Drug Discovery and Development: Overview of drug discovery pipelines, phases, and challenges. Biological Targets for Drug Action: Receptors, enzymes, nucleic acids, and protein targets. Principles of Structure-Activity Relationships (SAR): How chemical structure influences biological activity. Molecular Modelling Tools: Basics of computational drug design, docking, and molecular dynamics simulations. Drug-Receptor Interactions Mechanism of Drug Action: Ligand-receptor binding, affinity, and specificity. Pharmacodynamics and Pharmacokinetics (PK/PD): Absorption, distribution, metabolism, and excretion (ADME). Quantitative Structure-Activity Relationship (QSAR): Mathematical modelling of SAR. Case Studies: Key examples of successful drug-receptor interaction studies. Computational Drug Design and Screening, Introduction to Computer-Aided Drug Design (CADD): Role of computational methods in modern drug discovery. Virtual Screening and High-Throughput Screening: In silico screening techniques for lead discovery. Docking and Scoring Algorithms: Basics of molecular docking and evaluation of binding affinities. De Novo Drug Design: Designing new molecular entities using computational approaches. Drug Development and Optimization, Lead Optimization: Modifying lead compounds for improved efficacy and reduced toxicity. ADMET Properties: Assessing absorption, distribution, metabolism, excretion, and toxicity. Prodrug Design: Strategies to improve drug delivery and bioavailability. Chemical and Biological Synthesis of Drugs: Overview of synthetic routes for drug candidates.

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Koneru Lakshmaiah Education Foundation

Department of Biotechnology

Course Code: 25SDBT06

Course Title: CELL CULTURE TECHNOLOGIES

L-T-P-S: 1-0-0-4

Course Objective: The "Cell Culture Technologies" course provides a thorough understanding of the principles and techniques for cultivating cells, focusing on cell growth, maintenance, and bioreactor use, alongside applications in biopharmaceuticals and regenerative medicine.

Course Rationale: Cell culture technologies are essential in biopharmaceutical production and tissue engineering. This course equips students with practical skills for culturing various cell types and scaling processes, bridging theory and hands-on techniques to prepare them for advancements in biotechnology and medicine.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Cell Culture- Fundamentals of Cell Biology: Overview of cell types (prokaryotic and eukaryotic), structure, and function. Principles of Cell Culture: Aseptic techniques, media formulation, and culture conditions. Types of Cell Cultures: Primary cultures, continuous cell lines, and stem cell cultures. Cell Culture Equipment: Overview of incubators, biosafety cabinets, and cryopreservation systems. Techniques in Cell Culture, Cell Growth and Maintenance: Subculturing, monitoring cell health, and viability assays. Transfection and Transformation Techniques: Methods for introducing DNA/RNA into cells. Cell Characterization: Techniques for assessing cell morphology, growth rate, and metabolic activity. Application of Microcarrier Technology: Use of microcarriers for adherent cell culture. Scaling Up Cell Culture Processes, Bioreactor Design: Types of bioreactors (batch, fed-batch, continuous) and their applications. Scale-Up Techniques: Strategies for scaling from laboratory to industrial production. Process Optimization: Factors influencing growth (pH, temperature, oxygen levels) and optimization strategies. Quality Control in Cell Culture: Ensuring reproducibility, sterility, and consistency in cultures. Applications of Cell Culture Technologies- Biopharmaceutical Production: Use of cell cultures for producing monoclonal antibodies, vaccines, and recombinant proteins. Tissue Engineering: Principles of scaffold design, 3D cell culture, and tissue regeneration. Drug Development and Toxicity Testing: In vitro testing models for pharmacological studies. Regulatory Considerations: Compliance with guidelines for biopharmaceutical production and safety.	Introduction to Cell Culture- Fundamentals of Cell Biology: Overview of cell types (prokaryotic and eukaryotic), structure, and function. Principles of Cell Culture: Aseptic techniques, media formulation, and culture conditions. Types of Cell Cultures: Primary cultures, continuous cell lines, and stem cell cultures. Cell Culture Equipment: Overview of incubators, biosafety cabinets, and cryopreservation systems. Techniques in Cell Culture, Cell Growth and Maintenance: Subculturing, monitoring cell health, and viability assays. Transfection and Transformation Techniques: Methods for introducing DNA/RNA into cells. Cell Characterization: Techniques for assessing cell morphology, growth rate, and metabolic activity. Application of Microcarrier Technology: Use of microcarriers for adherent cell culture. Scaling Up Cell Culture Processes, Bioreactor Design: Types of bioreactors (batch, fed-batch, continuous) and their applications. Scale-Up Techniques: Strategies for scaling from laboratory to industrial production. Process Optimization: Factors influencing growth (pH, temperature, oxygen levels) and optimization strategies. Quality Control in Cell Culture: Ensuring reproducibility, sterility, and consistency in cultures. Applications of Cell Culture Technologies- Biopharmaceutical Production: Use of cell cultures for producing monoclonal antibodies, vaccines, and recombinant proteins. Tissue Engineering: Principles of scaffold design, 3D cell culture, and tissue regeneration. Drug Development and Toxicity Testing: In vitro testing models for pharmacological studies. Regulatory Considerations: Compliance with guidelines for biopharmaceutical production and safety. Advanced Cell Culture Technologies- 3D Cell Culture Techniques: Spheroids, organoids, and bioprinting applications. Microfluidics in Cell Culture: Use of lab-on-a-chip technologies for cell culture and analysis. Stem Cell and Gene Therapy Applications: Culturing stem cells and their potential in regenerative medicine. Ethical Considerations in Cell Culture: Addressing ethical issues related to stem cells, genetic modifications, and biopharmaceuticals.

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Course Code: 25SDBT07

Course Title: MASS SPECTROMETRY BASED PROTEOMICS

L-T-P-S: 1-0-0-4

Course Objective: This course aims to provide students with a comprehensive understanding of proteomics, with a focus on mass spectrometry (MS) technologies for protein identification, quantification, and characterization. It emphasizes both theoretical knowledge and practical skills in protein analysis for applications in biomedical research and biotechnology.

Course Rationale: Proteomics is central to understanding cellular functions and disease mechanisms at the protein level. Mass spectrometry has emerged as a key analytical tool in modern proteomics, enabling high-throughput, accurate protein analysis. This course equips students with the necessary skills to apply MS-based techniques in research and industry, preparing them for roles in molecular biology, diagnostics, and drug development.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Proteomics – Overview of proteomics and its relevance in functional genomics. Concepts of proteome complexity and dynamics. Basics of Mass Spectrometry – Principles of mass spectrometry, ionization methods (MALDI, ESI), mass analyzers (TOF, Q-TOF, Orbitrap). Sample Preparation for MS – Protein extraction, digestion (trypsin), desalting, and peptide purification. Protein Separation Techniques – SDS-PAGE, 2D-PAGE, liquid chromatography (HPLC, nanoLC). Protein Identification – Database searching (Mascot, SEQUEST), peptide mass fingerprinting, de novo sequencing. Quantitative Proteomics – Label-free vs. label-based quantification (SILAC, iTRAQ, TMT). Post-Translational Modifications (PTMs) – Identification and analysis of PTMs like phosphorylation, glycosylation, acetylation. Bioinformatics in Proteomics – Data analysis tools, protein databases (UniProt, PDB), pathway mapping. Clinical and Functional Proteomics – Biomarker discovery, disease mechanism studies, drug target identification.	Introduction to Proteomics – Overview of proteomics and its relevance in functional genomics. Concepts of proteome complexity and dynamics. Basics of Mass Spectrometry – Principles of mass spectrometry, ionization methods (MALDI, ESI), mass analyzers (TOF, Q-TOF, Orbitrap). Sample Preparation for MS – Protein extraction, digestion (trypsin), desalting, and peptide purification. Protein Separation Techniques – SDS-PAGE, 2D-PAGE, liquid chromatography (HPLC, nanoLC). Protein Identification – Database searching (Mascot, SEQUEST), peptide mass fingerprinting, de novo sequencing. Quantitative Proteomics – Label-free vs. label-based quantification (SILAC, iTRAQ, TMT). Post-Translational Modifications (PTMs) – Identification and analysis of PTMs like phosphorylation, glycosylation, acetylation. Bioinformatics in Proteomics – Data analysis tools, protein databases (UniProt, PDB), pathway mapping. Clinical and Functional Proteomics – Biomarker discovery, disease mechanism studies, drug target identification. Advanced Topics in Proteomics – Single-cell proteomics, spatial proteomics, proteogenomics integration, and emerging trends. Laboratory Component – Hands-on training in protein extraction, SDS-PAGE, trypsin digestion, LC-MS/MS data interpretation, and database searching.

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Course Code: 25SDBT08

Course Title: ANIMAL PHYSIOLOGY

L-T-P-S: 1-0-0-4

Course Objective: This course provides a comprehensive understanding of the physiological systems of animals, emphasizing mechanisms of homeostasis, integration of body systems, and the physiological basis of health and disease. It prepares students for advanced studies in biomedical science, animal biotechnology, and applied research.

Course Rationale: Animal physiology forms the basis of understanding how organisms function and adapt to internal and external changes. A strong foundation in this subject is essential for students pursuing careers in biotechnology, pharmacology, veterinary science, and biomedical research. The course integrates structure-function relationships with real-world applications to equip students for both academic and industry roles.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Animal Physiology – Basic principles of physiology, levels of organization, and homeostasis. Comparative approaches in physiology, Cellular Physiology – Membrane potential, transport mechanisms, osmoregulation, and cell signaling. Muscle and Nerve Physiology – Structure of neurons and muscle fibers, mechanism of nerve impulse transmission, synaptic transmission, and excitation-contraction coupling. Circulatory System – Components of blood, structure and function of heart, blood pressure regulation, and lymphatic system. Respiratory System – Mechanism of breathing, gas exchange, oxygen transport, and regulation of respiration. Digestive System – Digestive enzymes, absorption, gastrointestinal hormones, and nutrition. Excretory System – Structure and function of kidney, urine formation, osmoregulation. Endocrine System – Hormone classification, mechanisms of hormone action, feedback regulation. Reproductive System – Structure and function of male and female reproductive systems, fertilization, pregnancy. Immune and Thermoregulatory Systems – Overview of innate and adaptive immunity, thermoregulation.	Introduction to Animal Physiology – Basic principles of physiology, levels of organization, and homeostasis. Comparative approaches in physiology, Cellular Physiology – Membrane potential, transport mechanisms, osmoregulation, and cell signaling. Muscle and Nerve Physiology – Structure of neurons and muscle fibers, mechanism of nerve impulse transmission, synaptic transmission, and excitation-contraction coupling. Circulatory System – Components of blood, structure and function of heart, blood pressure regulation, and lymphatic system. Respiratory System – Mechanism of breathing, gas exchange, oxygen transport, and regulation of respiration. Digestive System – Digestive enzymes, absorption, gastrointestinal hormones, and nutrition. Excretory System – Structure and function of kidney, urine formation, osmoregulation. Endocrine System – Hormone classification, mechanisms of hormone action, feedback regulation. Reproductive System – Structure and function of male and female reproductive systems, fertilization, pregnancy. Immune and Thermoregulatory Systems – Overview of innate and adaptive immunity, thermoregulation. Integrative Physiology and Applications – Application of animal physiology in pharmacology, toxicology, and biotechnology. Introduction to animal models in research.


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Department of Biotechnology

Course Code: 25BT2224F

Course Title: BIOREACTOR OPERATIONS

L-T-P-S: 2-0-2-0

Course Objective: The "Bioreactor Operations" course aims to provide students with a thorough understanding of the design, operation, and optimization of bioreactors for various biological processes, focusing on parameters like mass transfer and nutrient supply essential for optimal performance in industrial applications.

Course Rationale: Given the critical role of bioreactors in producing biopharmaceuticals and biofuels, there is a high demand for skilled professionals in bioprocess engineering. This course equips students with the knowledge and practical skills needed to design, operate, and troubleshoot bioreactor systems, preparing them to drive advancements in biotechnology and improve process efficiency and sustainability.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to bioreactor design: Introduction; General design information; Material and energy balance calculations; Process Flow, Scale up and scale down processes: Scale up and scale down issues: Effect of scale on oxygenation, mixing, sterilization, pH, temperature, inoculum development, nutrient availability and supply; Bioreactor scaleup based on constant power consumption per volume, mixing time, impeller tip speed (shear), mass transfer coefficients. Scale-up of downstream processes: Adsorption (LUB method); Chromatography (constant resolution etc.); Filtration (constant resistance etc.); Centrifugation (equivalent times etc.); Extractors (geometry based rules). Scale-down related aspects. Basic bioreactor operations: Spectrum of basic bioreactor operations: immobilized cell system, animal cells, plant cell cultures and waste management; Enzyme immobilization techniques; Bioconversion using immobilized enzyme preparation; Bioconversion in batch, Fed-batch and continuous bioreactors; Mass transfer in immobilized cell/enzyme reactor. Bioreactor facility design: Facility design aspects; Utility supply aspects; Equipment cleaning aspects; Culture cell banks; cGMP guidelines; Validation; Safety; Process economics; Case studies. Bioreactor equipment: Selection of bioprocess equipment (upstream and downstream); Specifications of bioprocess equipment; Mechanical design of reactors, heat transfer and mass transfer equipment; Design considerations for maintaining sterility of process streams and process equipment; Piping and instrumentation; Materials of construction for bioprocess plants.	Introduction to bioreactor design: Introduction; General design information; Material and energy balance calculations; Process Flow, Scale up and scale down processes: Scale up and scale down issues: Effect of scale on oxygenation, mixing, sterilization, pH, temperature, inoculum development, nutrient availability and supply; Bioreactor scaleup based on constant power consumption per volume, mixing time, impeller tip speed (shear), mass transfer coefficients. Scale-up of downstream processes: Adsorption (LUB method); Chromatography (constant resolution etc.); Filtration (constant resistance etc.); Centrifugation (equivalent times etc.); Extractors (geometry based rules). Scale-down related aspects. Basic bioreactor operations: Spectrum of basic bioreactor operations: immobilized cell system, animal cells, plant cell cultures and waste management; Enzyme immobilization techniques; Bioconversion using immobilized enzyme preparation; Bioconversion in batch, Fed-batch and continuous bioreactors; Mass transfer in immobilized cell/enzyme reactor. Bioreactor facility design: Facility design aspects; Utility supply aspects; Equipment cleaning aspects; Culture cell banks; cGMP guidelines; Validation; Safety; Process economics; Case studies, Advanced Bioreactor Technologies- Novel Bioreactor Designs: Introduction to immobilized cell systems, microreactors, and bioreactor arrays. Applications of Bioreactors: Case studies in biopharmaceutical production, biofuels, and food industry applications. Environmental and Economic Considerations: Sustainability in bioprocessing and lifecycle assessment of bioreactor operations. Future Trends in Bioreactor Technology: Innovations and research directions in bioreactor systems.

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Department of Biotechnology

Course Code: 25BT2239F

Course Title: COMPUTATIONAL BIOLOGY

L-T-P-S: 2-0-2-0

Course Objective: The "Computational Biology" course equips students with the skills to apply computational techniques for analyzing biological data and solving complex problems. It focuses on algorithms, modeling approaches, and data analysis tools in genomics, proteomics, and systems biology, emphasizing the integration of biological knowledge with computational methods to advance research in biotechnology and medicine.

Course Rationale: As biological research generates vast amounts of data, there is a rising demand for professionals skilled in analyzing and interpreting this information with computational tools. This course combines biology, mathematics, and computer science to equip students with a multidisciplinary approach to problem-solving. By bridging these fields, students will be prepared to address challenges in genomics, drug discovery, and personalized medicine, enhancing their employability in the biotechnology sector.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Computational Biology- Overview of Computational Biology: Definition, scope, and applications in research and industry. Biological Data Types: Understanding genomic, proteomic, and metabolomic data. Basic Programming for Biologists: Introduction to programming languages (e.g., Python, R) and their applications in biological analysis. Data Formats and Databases: Overview of biological databases (GenBank, UniProt) and data management. Sequence Analysis and Bioinformatics- DNA and Protein Sequence Analysis: Algorithms for sequence alignment (BLAST, Smith-Waterman) and motif discovery. Genomic Annotation: Tools and methods for gene prediction and functional annotation. Phylogenetics: Construction of phylogenetic trees and evolutionary analysis. Variant Analysis: Techniques for analyzing genetic variations and their implications in health and disease. Structural Biology and Molecular Modeling-Introduction to Molecular Structures: Understanding protein structure, folding, and function. Computational Tools for Structural Biology: Software for molecular dynamics simulations and protein modeling (e.g., PyMOL, Chimera). Docking Studies: Methods for predicting interactions between proteins and ligands. Structure-Activity Relationship (SAR): Analyzing the relationship between chemical structure and biological activity. Systems Biology and Network Analysis- Introduction to Systems Biology: Overview of biological systems and their complexity. Modelling Biological Networks: Approaches for modelling gene regulatory, metabolic, and signalling networks. Dynamic Simulation of Biological Systems: Techniques for simulating and analyzing biological processes over time. Data Integration and Interpretation: Methods for integrating multi-omics data and extracting biological insights.	Introduction to Computational Biology- Overview of Computational Biology: Definition, scope, and applications in research and industry. Biological Data Types: Understanding genomic, proteomic, and metabolomic data. Basic Programming for Biologists: Introduction to programming languages (e.g., Python, R) and their applications in biological analysis. Data Formats and Databases: Overview of biological databases (GenBank, UniProt) and data management. Sequence Analysis and Bioinformatics- DNA and Protein Sequence Analysis: Algorithms for sequence alignment (BLAST, Smith-Waterman) and motif discovery. Genomic Annotation: Tools and methods for gene prediction and functional annotation. Phylogenetics: Construction of phylogenetic trees and evolutionary analysis. Variant Analysis: Techniques for analyzing genetic variations and their implications in health and disease. Structural Biology and Molecular Modeling- Introduction to Molecular Structures: Understanding protein structure, folding, and function. Computational Tools for Structural Biology: Software for molecular dynamics simulations and protein modeling (e.g., PyMOL, Chimera). Docking Studies: Methods for predicting interactions between proteins and ligands. Structure-Activity Relationship (SAR): Analyzing the relationship between chemical structure and biological activity. Systems Biology and Network Analysis- Introduction to Systems Biology: Overview of biological systems and their complexity. Modeling Biological Networks: Approaches for modeling gene regulatory, metabolic, and signaling networks. Dynamic Simulation of Biological Systems: Techniques for simulating and analyzing biological processes over time. Data Integration and Interpretation: Methods for integrating multi-omics data and extracting biological insights. Applications and Future Trends in Computational Biology- Applications in Drug Discovery: Role of computational biology in identifying drug targets and optimizing lead compounds. Personalized Medicine: Understanding the impact of genomics on individualized treatment strategies. Machine Learning in Biology: Introduction to machine learning techniques and their applications in biological data analysis. Ethical Considerations: Discussing ethical implications of computational biology in research and clinical applications.



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Department of Biotechnology

Course Code: 251BT3101

Course Title: PHARMACEUTICAL BIOTECHNOLOGY

L-T-P-S: 3-0-2-0

Course Objective: The "Pharmaceutical Biotechnology" course provides an understanding of biotechnological processes in developing pharmaceutical products, covering manufacturing, genetic engineering, monoclonal antibodies, and regulatory frameworks to prepare students for the industry.

Course Rationale: As biopharmaceuticals gain prominence in medicine, the demand for professionals with expertise in biotechnology and pharmaceutical sciences increases. This course equips students to navigate the complexities of the biopharmaceutical industry, addressing research, development, and regulatory challenges.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Fundamentals of pharmaceutical practice-Pharmaceutical biotechnology: An introduction; Origin & definition; Scope & Importance of Biotechnology; their applications; Microbes in Pharmaceutical industry; Methods of Gene transfer; Biotechnology; Production of Secondary Metabolites ;Drug Interactions; Surgical supplies. Drug metabolism and pharmacokinetics- ADME-properties-Mechanism of Drug Absorption; Distribution of drugs; Drug metabolism(Biotransformation of drugs);Excretion of drugs; Pharmacokinetics; Basic considerations; Controlled Release Medication; Design of Controlled drug delivery systems; Drug release patterns; Oral parental; Trans-dermal ; Ophthalmic ; Intra-vaginal and Intrauterine Drug Delivery systems. Pharmaceutical dosage & blood, plasma products-Materials & Formulations; Manufacture of Tablets; Capsules; Sustained Release dosage forms; Parental solutions; Oral liquids; Emulsions; Ointments; Suppositories, Aerosols; Topical applications; Collection; Processing and storage of whole human blood; Concentrated human RBC Control of Blood products; Transfusion products. Pharmaceutical products-Fundamentals of Therapeutic categories such as Analgesics, Anesthetics, Antipyretic; Anti-inflammatory drugs; Antacids; Alkaloids; Glycosides; Hormone & Hormone antagonists; Antineoplastics and Immuno active drugs; Biologicals (Immunizing agents and allergenic extracts).	Fundamentals of pharmaceutical practice-Pharmaceutical biotechnology: An introduction; Origin & definition; Scope & Importance of Biotechnology; their applications; Microbes in Pharmaceutical industry; Methods of Gene transfer; Biotechnology; Production of Secondary Metabolites ;Drug Interactions; Surgical supplies. Drug metabolism and pharmacokinetics- ADME-properties-Mechanism of Drug Absorption; Distribution of drugs; Drug metabolism(Biotransformation of drugs);Excretion of drugs; Pharmacokinetics; Basic considerations; Controlled Release Medication; Design of Controlled drug delivery systems; Drug release patterns; Oral parental; Trans-dermal ; Ophthalmic ; Intra-vaginal and Intrauterine Drug Delivery systems. Pharmaceutical dosage & blood, plasma products-Materials & Formulations; Manufacture of Tablets; Capsules; Sustained Release dosage forms; Parental solutions; Oral liquids; Emulsions; Ointments; Suppositories, Aerosols; Topical applications; Collection; Processing and storage of whole human blood; Concentrated human RBC Control of Blood products; Transfusion products. Pharmaceutical products-Fundamentals of Therapeutic categories such as Analgesics, Anesthetics, Antipyretic; Anti-inflammatory drugs; Antacids; Alkaloids; Glycosides; Hormone & Hormone antagonists; Antineoplastics and Immuno active drugs; Biologicals (Immunizing agents and allergenic extracts). Drug manufacturing processes- Good manufacturing practices; Manufacturing facilities; Sources of Biopharmaceuticals; Production & analysis of Biopharmaceuticals.

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Department of Biotechnology

Course Code: 25MBT3101

Course Title: STEMCELL TECHNOLOGY

L-T-P-S: 3-0-2-0

Course Objective: The "Stem Cell Technology" course provides a comprehensive understanding of stem cell biology, including types, properties, and applications in research and medicine. It covers techniques for isolation, culture, differentiation, and therapeutic applications, equipping students to advance stem cell research in regenerative medicine.

Course Rationale: With significant implications for regenerative medicine, disease modeling, and drug discovery, stem cell technology is a rapidly advancing field. This course meets the growing demand for professionals with expertise in stem cell research by integrating foundational knowledge with practical skills, fostering innovation and the development of novel therapeutic strategies.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Human embryonic development, Stem cells classification, Stem cell properties, Embryonic stem cells (ESCs), Embryo preparation – IVF, SCNT, Inner cell mass isolation, ESC maintenance – role of feeder layer, Feeder free culture, media requirement. Molecular basis of pluripotency, transcription factors, signaling pathways, Cell surface markers, Human v/s mouse stem cells. Adult stem cells, Adult mammalian stem cell niche – basic design, Epidermal stem cell niche, Stem cell niche in wound regeneration, Intestinal stem cell niche, Hematopoietic stem cell niche, iPSCs, small molecules in iPSC generation. Epigenetic factors in stem cell biology, Characterization of stem cells, Stem cell differentiation, differentiation methods, Factors affecting differentiation – Biophysical, Biochemical, and Mechanobiological. Tissue engineering and Stem cell therapy - heart diseases, diabetes, burns & skin ulcers, muscular dystrophy, orthopedic applications, neurodegenerative diseases.	Human embryonic development, Stem cells classification, Stem cell properties, Embryonic stem cells (ESCs), Embryo preparation – IVF, SCNT, Inner cell mass isolation, ESC maintenance – role of feeder layer, Feeder free culture, media requirement. Molecular basis of pluripotency, transcription factors, signaling pathways, Cell surface markers, Human v/s mouse stem cells. Adult stem cells, Adult mammalian stem cell niche – basic design, Epidermal stem cell niche, Stem cell niche in wound regeneration, Intestinal stem cell niche, Hematopoietic stem cell niche, iPSCs, small molecules in iPSC generation. Epigenetic factors in stem cell biology, Characterization of stem cells, Stem cell differentiation, differentiation methods, Factors affecting differentiation – Biophysical, Biochemical, and Mechanobiological. Tissue engineering and Stem cell therapy - heart diseases, diabetes, burns & skin ulcers, muscular dystrophy, orthopedic applications, neurodegenerative diseases. Stem cells and Biopharming, Genetic manipulation of Stem cell, Ethics of human cell research-immortal cells and moral selves, Ethical considerations, stem cell-based therapies. FDA products and preclinical regulatory considerations.


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Department of Biotechnology

Course Code: 25BIS3202

Course Title: BIOMEDICAL INFORMATICS

L-T-P-S: 3-0-0-0

Course Objective To provide students with the knowledge and skills to manage biomedical data, analyse complex datasets, and apply computational techniques for improved decision-making and innovation in healthcare.

Course Rationale: Biomedical Informatics is essential in modern healthcare for improving patient outcomes, advancing research, and optimizing healthcare systems. This course prepares students to meet the growing demand for expertise in integrating data, technology, and clinical applications.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Biomedical Informatics-Definition and scope of Biomedical Informatics, History and evolution of healthcare informatics, Types of biomedical data: clinical, genomic, imaging, Key concepts: Data, Information, and Knowledge, Healthcare information systems and electronic health records (EHRs), Case studies: Impact of informatics on healthcare. Data Management and Integration in Healthcare- Principles of data collection, storage, and security, Standards in healthcare data exchange (HL7, FHIR), Database design and management for biomedical data, Data integration across healthcare systems, Introduction to cloud computing in healthcare, Ethical and legal considerations in biomedical data management. Biomedical Data Analytics and Machine Learning- Statistical analysis of biomedical data, Introduction to machine learning techniques for healthcare, Applications of artificial intelligence in diagnostics and personalized medicine, Predictive modeling and decision support systems, Data visualization in healthcare, Case studies: Machine learning in clinical practice. Genomics and Bioinformatics- Basics of bioinformatics in clinical applications, Genomic data: sequencing technologies and databases, Computational approaches for analyzing genomic data, Integration of genomics with clinical information, Applications in personalized medicine and drug discovery, Case studies: Genomic medicine	Introduction to Biomedical Informatics-Definition and scope of Biomedical Informatics, History and evolution of healthcare informatics, Types of biomedical data: clinical, genomic, imaging, Key concepts: Data, Information, and Knowledge, Healthcare information systems and electronic health records (EHRs), Case studies: Impact of informatics on healthcare. Data Management and Integration in Healthcare- Principles of data collection, storage, and security, Standards in healthcare data exchange (HL7, FHIR), Database design and management for biomedical data, Data integration across healthcare systems, Introduction to cloud computing in healthcare, Ethical and legal considerations in biomedical data management. Biomedical Data Analytics and Machine Learning- Statistical analysis of biomedical data, Introduction to machine learning techniques for healthcare, Applications of artificial intelligence in diagnostics and personalized medicine, Predictive modeling and decision support systems, Data visualization in healthcare, Case studies: Machine learning in clinical practice. Genomics and Bioinformatics- Basics of bioinformatics in clinical applications, Genomic data: sequencing technologies and databases, Computational approaches for analyzing genomic data, Integration of genomics with clinical information, Applications in personalized medicine and drug discovery, Case studies: Genomic medicine. Emerging Technologies in Biomedical Informatics- Big data and its impact on healthcare, Role of mobile health (mHealth) and wearable technologies, Telemedicine and remote patient monitoring, Applications of blockchain in healthcare data security, Future trends: AI, precision medicine, and biomedical research, Case studies: Innovations in healthcare informatics

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Department of Biotechnology

Course Code: 23HDA3203

Course Title: GENETIC PROGRAMMING

L-T-P-S: 3-0-0-0

Course Objective To equip students with the knowledge to apply genetic programming techniques for solving complex optimization and machine learning problems through evolutionary algorithms.

Course Rationale: Genetic Programming is vital for developing adaptive, self-improving systems in AI and optimization. The course prepares students to use evolutionary algorithms for solving real-world challenges across various fields.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Genetic Programming- Overview of evolutionary algorithms and genetic programming, Key concepts: population, selection, crossover, mutation, Historical development and applications of genetic programming, Differences between genetic algorithms and genetic programming, Basic structure of a genetic programming system, Case studies: Genetic programming in real-world problems. Genetic Programming Techniques and Operators- Representation of solutions: trees, graphs, and linear structures, Genetic operators: mutation, crossover, reproduction, Selection methods: roulette wheel, tournament, rank-based, Fitness evaluation and selection pressure, Parameter tuning and control strategies, Case studies: Operator selection in problem-solving Advanced Topics in Genetic Programming- Multi-objective optimization using genetic programming, Automatic programming and symbolic regression, Program bloat and control techniques (parsimony, depth limits), Hybrid methods: combining genetic programming with machine learning, Co-evolutionary genetic programming, Case studies: Applications in robotics and AI. Genetic Programming for Machine Learning and AI- Evolving neural networks with genetic programming, Feature selection and dimensionality reduction, Evolutionary design of classifiers and decision trees, Reinforcement learning with genetic programming, Genetic programming in deep learning applications, Case studies: AI systems developed through genetic programming.	Introduction to Genetic Programming- Overview of evolutionary algorithms and genetic programming, Key concepts: population, selection, crossover, mutation, Historical development and applications of genetic programming, Differences between genetic algorithms and genetic programming, Basic structure of a genetic programming system, Case studies: Genetic programming in real-world problems. Genetic Programming Techniques and Operators- Representation of solutions: trees, graphs, and linear structures, Genetic operators: mutation, crossover, reproduction, Selection methods: roulette wheel, tournament, rank-based, Fitness evaluation and selection pressure, Parameter tuning and control strategies, Case studies: Operator selection in problem-solving Advanced Topics in Genetic Programming- Multi-objective optimization using genetic programming, Automatic programming and symbolic regression, Program bloat and control techniques (parsimony, depth limits), Hybrid methods: combining genetic programming with machine learning, Co-evolutionary genetic programming, Case studies: Applications in robotics and AI. Genetic Programming for Machine Learning and AI- Evolving neural networks with genetic programming, Feature selection and dimensionality reduction, Evolutionary design of classifiers and decision trees, Reinforcement learning with genetic programming, Genetic programming in deep learning applications, Case studies: AI systems developed through genetic programming. Applications and Future Trends of Genetic Programming- Applications in finance, engineering, and bioinformatics, Genetic programming for automated software development, Genetic programming in autonomous systems and robotics, Future directions: quantum computing and genetic programming, Ethical considerations and challenges, Case studies: Cutting-edge applications and innovations

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Department of Biotechnology

Course Code: 231BT3203

Course Title: Bioprocess Economics and Plant Design

L-T-P-S: 3-0-0-0

Course Objective The objectives of the course are to introduce basic concepts about tax and depreciation, Cash flow diagrams, breakeven point, elements of total production cost, design information and flow diagrams, equipment classification, corrosion types, design of batch and continuous sterilizers and problems analyzing in basic design.

Course Rationale: In bioprocess economics and plant design course, students will explore more deeply into complex topics including economic evaluation and its importance, breakeven point and cost analysis, students will be able to know the manufacturing cost estimation for antibiotics, recombinant products, single cell protein. Students will be also to explore the problem analysing abilities in basic design of fermenter.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Economic evaluation: Capital cost of a project. Interest calculations, nominal and effective interest rates. Basic concepts in tax and depreciation. Measures of economic performance, rate of return, payout time. Cash flow diagrams; Cost accounting-balance sheet and profit loss account. Break even and minimum cost analysis. Bioprocess Economics: Introduction, elements of total production cost, outline of the total capital investment, equipment sizing, capital cost estimates large-scale equipment and utilities .Manufacturing cost estimates - Operating costs-Raw materials, utilities, fixed costs and overhead costs, case studies of antibiotics, recombinant products, single cell protein. Introduction to process design: Introduction to different types of valves, pumps, steam traps, spargers and impellers used in fermentation industries. Schematic representation of unit operations, design information and flow diagrams, material and energy balances, formulation of the design problem, the Hierarchy of chemical process design and integration, optimization, Health and safety Hazards, Environment protection, plant location and lay out. Equipment classification, materials of construction-Mechanical properties-strength, elasticity, ductility, resilience, toughness, hardness, creep, fatigue. Metals-ferrous metals, types of iron & steels, nonferrous metals and Non-metals. Corrosion: Forms of corrosion and their presentation. Choice of materials. Design conventions. Basic considerations in equipment design: General design procedure.	Economic evaluation: Capital cost of a project. Interest calculations, nominal and effective interest rates. Basic concepts in tax and depreciation. Measures of economic performance, rate of return, payout time. Cash flow diagrams; Cost accounting-balance sheet and profit loss account. Break even and minimum cost analysis. Bioprocess Economics: Introduction, elements of total production cost, outline of the total capital investment, equipment sizing, capital cost estimates large-scale equipment and utilities .Manufacturing cost estimates - Operating costs-Raw materials, utilities, fixed costs and overhead costs, case studies of antibiotics, recombinant products, single cell protein. Introduction to process design: Introduction to different types of valves, pumps, steam traps, spargers and impellers used in fermentation industries. Schematic representation of unit operations, design information and flow diagrams, material and energy balances, formulation of the design problem, the Hierarchy of chemical process design and integration, optimization, Health and safety Hazards, Environment protection, plant location and lay out. equipment classification, materials of construction-Mechanical properties-strength, elasticity, ductility, resilience, toughness, hardness, creep, fatigue. Metals-ferrous metals, types of iron & steels, nonferrous metals and Non-metals. Corrosion: Forms of corrosion and their presentation. Choice of materials. Design conventions. Basic considerations in equipment design: General design procedure: Basic Design Problems: Design examples on continuous fermentation, aeration and agitation. Design calculation of filter for air sterilization. Design of batch and continuous sterilizers. Design calculations for immobilized enzyme kinetics. Practical considerations in designing of Bioreactor/Fermenter construction. Design exercise on trickle flow fermenter. Problems associated with design equations



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Department of Biotechnology

Course Code: 23IBT3304

Course Title: Enzyme Engineering

L-T-P-S: 3-0-0-2

Course Objective The objective of this course is to provide the principles and practices involved in the enzymatic reactions' chemistry and its application.

Course Rationale: The purpose of learning this course, Enzyme Engineering, is to understand the basic concepts of enzymes and understand the mechanisms and actions involved in enzymes in biochemical reactions and applications

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Enzymes: Nomenclature and Classification. Criteria of purity of enzymes-Specific activity. Enzyme units-Katal and IU. Enzyme activity, Non-protein enzymes- Ribozymes and DNAzymes. Metalloenzymes and metal activated enzymes. Coenzymes and Cofactors- Prosthetic group, coenzymes involved in different metabolic pathways. Classification of coenzymes. Enzyme Catalysis and Inhibition: Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis. Mechanism of Serine proteases-Chymotrypsin, Lysozyme, Carboxypeptidase A and Ribonuclease. Proenzymes (Zymogens). Reversible Inhibition: Competitive, Non-Competitive, Uncompetitive, Mixed, Substrate, Allosteric and Product Inhibition. Irreversible Inhibition- Suicide inhibition. Examples and Mechanism of various Inhibitions like Penicillin, Iodoacetamide and DIPF. Enzyme Kinetics: Factors affecting the enzyme activity. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten kinetics, Estimation of kinetic parameters, Turnover number, Kinetics of Enzyme Inhibition, Kinetics Allosteric enzymes. Enzyme Regulation: Feedback Regulation, Allosteric Regulation, Reversible Covalent Modification and Proteolytic Activation. Organisation of enzymes in the cell. Enzymes in the cell, localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations.	Introduction to Enzymes: Nomenclature and Classification. Criteria of purity of enzymes- Specific activity. Enzyme units- Katal and IU. Enzyme activity, Non-protein enzymes- Ribozymes and DNAzymes. Metalloenzymes and metal activated enzymes. Coenzymes and Cofactors- Prosthetic group, coenzymes involved in different metabolic pathways. Classification of coenzymes. Enzyme Catalysis and Inhibition: Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis. Mechanism of Serine proteases-Chymotrypsin, Lysozyme, Carboxypeptidase A and Ribonuclease. Proenzymes (Zymogens). Reversible Inhibition: Competitive, Non-Competitive, Uncompetitive, Mixed, Substrate, Allosteric and Product Inhibition. Irreversible Inhibition- Suicide inhibition. Examples and Mechanism of various Inhibitions like Penicillin, Iodoacetamide and DIPF. Enzyme Kinetics: Factors affecting the enzyme activity. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten kinetics, Estimation of kinetic parameters, Turnover number, Kinetics of Enzyme Inhibition, Kinetics Allosteric enzymes. Enzyme Regulation: Feedback Regulation, Allosteric Regulation, Reversible Covalent Modification and Proteolytic Activation. Organisation of enzymes in the cell. Enzymes in the cell, localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations. Mechanisms of enzyme degradation, lysosomal and nonlysosomal pathways, examples. Applied Enzymology: Industrial Enzymes, enzymes used in various fermentation processes, Clinical enzymes, Isoenzymes; Immobilization of enzymes, ELISA. Biosensors. Enzyme Engineering and site directed mutagenesis, Designer enzymes.

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Department of Biotechnology

Course Code: 25BT3110

Course Title: Biochemical Reaction Engineering

L-T-P-S: 3-0-2-0

Course Objective: To enhance students' employability by equipping them with the skills and knowledge necessary to excel in a variety of roles within the biotechnology and pharmaceutical sectors, as well as related fields where biochemical reaction engineering plays a crucial role.

Course Rationale: A course in Biochemical Reaction Engineering is rationale for employability as it provides students with the skills and knowledge necessary for careers in industries where bio processing and biotechnology play a pivotal role. This background enhances graduates' competitiveness and employability in a variety of roles across the biotech and pharmaceutical sectors.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Over View of Biochemical Reaction Engineering- Over view of biochemical reaction Engineering; Classification of reactions; Reaction rate; Kinetics of homogenous reactions; Single and multiple reactions; Elementary and Non elementary reactions; Molecularity and order of reactions; rate constant; Kinetic models of non-elementary reactions; Temperature dependency of rate equation. Interpretation of Batch Reactor Data-Constant volume batch reactor; Analysis of total pressure data; The conversion; Integral method of analysis of data; Irreversible uni-molecular, bimolecular reactions; Zero order reactions. Half life of a reaction; Varying volume batch reactor; differential method of analysis; Integral method of analysis; Zero order; First order & second order reactions; Temperature & reaction rate.: Bioreactor Systems- Definitions; Differences and similarities between chemical and bioreactors; Classification of bioreactors; Reactor configurations; Description of a conventional bioreactor with all aspects; Design and construction criteria of a bioreactor; Concept of ideal and non ideal reactors; Residence time distribution; stimulus response techniques; Models of non ideal reactors; Imperfect mixing. Designing Of Bioreactors- batch growth of microorganism; Design equation of a plug flow reactor; Design of CSTR with wash out concept; Stirred tank reactors with recycle of biomass; Continuous stirred tank Fermenters in series with out and with recycle of biomass; Estimation of kinetic parameters. Multiphase Bioreactors-Different types of reactors: Cell lift reactor; Multipurpose tower reactor; Liquid impelled loop reactor; Pumped tower loop reactor; Fluidized-bed reactor; Packed bed reactor; bubble column reactors, Airlift reactors Gas inducing reactors. Animal & plant cell reactor technology- Environmental requirements for animal cell cultivation; Reactors for large scale production using animal cells, plant cell cultivation	Over View of Biochemical Reaction Engineering- Over view of biochemical reaction Engineering; Classification of reactions; Reaction rate; Kinetics of homogenous reactions; Single and multiple reactions; Elementary and Non elementary reactions; Molecularity and order of reactions; rate constant; Kinetic models of non-elementary reactions; Temperature dependency of rate equation. Interpretation of Batch Reactor Data-Constant volume batch reactor; Analysis of total pressure data; The conversion; Integral method of analysis of data; Irreversible uni-molecular, bimolecular reactions; Zero order reactions. Half life of a reaction; Varying volume batch reactor; differential method of analysis; Integral method of analysis; Zero order; First order & second order reactions; Temperature & reaction rate.: Bioreactor Systems- Definitions; Differences and similarities between chemical and bioreactors; Classification of bioreactors; Reactor configurations; Description of a conventional bioreactor with all aspects; Design and construction criteria of a bioreactor; Concept of ideal and non ideal reactors; Residence time distribution; stimulus response techniques; Models of non ideal reactors; Imperfect mixing. Designing Of Bioreactors- Design equations for enzyme reactors; batch growth of microorganism; Design equation of a plug flow reactor; Design of CSTR with wash out concept; Stirred tank reactors with recycle of biomass; Continuous stirred tank fermentors in series with out and with recycle of biomass; Estimation of kinetic parameters. Multiphase Bioreactors-Different types of reactors: Cell lift reactor; Multipurpose tower reactor; Liquid impelled loop reactor; Pumped tower loop reactor; Fluidized-bed reactor; Packed bed reactor; bubble column reactors, Airlift reactors Gas inducing reactors. Animal & plant cell reactor technology- Environmental requirements for animal cell cultivation; Reactors for large scale production using animal cells, plant cell cultivation



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Department of Biotechnology

Course Code: 25BT3112 **Course Title:** TRANSPORT PROCESS IN BIOLOGICAL SYSTEMS
L-T-P-S: 3-0-2-0

Course Objective: The objective of this course is to introduce the fundamental principles of momentum, heat, and mass transfer, and their applications in biological systems. It aims to help students understand how transport phenomena govern physiological processes and biotechnological operations, such as blood flow, oxygen transfer, nutrient delivery, and product recovery. The course develops analytical and problem-solving skills essential for modelling and designing bioprocesses that involve transport mechanisms in living and engineered systems.

Course Rationale: Transport processes are vital to both natural biological functions and industrial biotechnological applications. A clear understanding of how fluids, heat, and molecules move through biological media is crucial for areas such as drug delivery, tissue engineering, fermentation, and bioreactor design. This course provides the theoretical and practical foundation needed to analyze and optimize these systems. By bridging engineering principles with biological complexity, it prepares students to tackle challenges in designing efficient, scalable, and sustainable biotechnological solutions.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Transport Process – momentum, heat and mass transfer in bio processing, Analogy between mass, heat and momentum transfer. Momentum Transfer –Conservation of Mass, Conservation of Energy, Momentum Balance–Momentum Balance in a Circular Pipe, Flow Velocity Profile, Reynolds Experiment, Bernoulli's theorem, Fermentation Broth Rheology – Viscosity, Rheological Properties of Fermentation Broths, Factors affecting broth viscosity, Hydrodynamic methods- orifice and venturimeter, Rota meters. Heat Transfer – Various Modes of heat transfer, viz., conduction convection and radiation. Calculation of Heat-Transfer Coefficients. Application of heat transfer in Bio processing. Heat Management in Bioreactors, Relationship between heat transfer, cell concentration and stirring conditions. Mass Transfer – Diffusivity, theory of diffusion, role of diffusion in bio processing. Definition of binary mass transfer coefficients. Convective mass transfer – Liquid-solid, liquid-liquid, gas-liquid mass transfers, Oxygen transport to microbial cultures – Gas liquid mass transfer fundamentals. Oxygen requirement of microbial cultures. Oxygen transfer by aeration and agitation. Determination of oxygen mass transfer coefficient by various methods.	Introduction to Transport Process – momentum, heat and mass transfer in bio processing, Analogy between mass, heat and momentum transfer. Momentum Transfer –Conservation of Mass, Conservation of Energy, Momentum Balance–Momentum Balance in a Circular Pipe, Flow Velocity Profile, Reynolds Experiment, Bernoulli's theorem, Fermentation Broth Rheology – Viscosity, Rheological Properties of Fermentation Broths, Factors affecting broth viscosity, Hydrodynamic methods- orifice and venturimeter, Rota meters. Heat Transfer – Various Modes of heat transfer, viz., conduction convection and radiation. Calculation of Heat-Transfer Coefficients. Application of heat transfer in Bio processing. Heat Management in Bioreactors, Relationship between heat transfer, cell concentration and stirring conditions. Mass Transfer – Diffusivity, theory of diffusion, role of diffusion in bio processing. Definition of binary mass transfer coefficients. Convective mass transfer – Liquid-solid, liquid-liquid, gas-liquid mass transfers, Oxygen transport to microbial cultures – Gas liquid mass transfer fundamentals. Oxygen requirement of microbial cultures. Oxygen transfer by aeration and agitation. Determination of oxygen mass transfer coefficient by various methods. Unit operations: Drying, Evaporation, Extraction, Adsorption, Leaching, Crystallization



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Department of Biotechnology

Course Code: 25BT2235F

Course Title: BIOPROCESS ENGINEERING

L-T-P-S: 2-0-2-0

Course Objective: The objective of this course is to provide students with a comprehensive understanding of the principles and applications of bioprocess engineering. It aims to develop the ability to analyze, design, and optimize biological processes by integrating knowledge of microbiology, biochemistry, and chemical engineering. The course equips students with the skills to understand and apply concepts related to bioreactor design, scale-up, fermentation technology, mass transfer, and downstream processing for industrial biotechnology applications.

Course Rationale: Bioprocess Engineering forms the backbone of industrial biotechnology by enabling the large-scale production of bio-based products such as pharmaceuticals, enzymes, biofuels, and food additives. With the growing demand for sustainable and efficient biological manufacturing processes, this course provides essential engineering tools and process understanding to bridge the gap between laboratory-scale research and commercial production. It ensures that students are industry-ready by imparting both theoretical foundations and practical approaches to bioprocess design, operation, and control.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction, Microbes and enzymes of industrial importance, Different types of bioreactors and bioreactor design, Microbial growth, substrate degradation and product formation kinetics, Instrumentation, Sterilization of air, media and reactor, Upstream and Downstream processing, Production of Oxy Chemicals I: Tax and non-tax alcohol, Brewing industry, Production of Oxy Chemicals II: Wine making, Vinegar and citric acid production, Metal leaching, Bioenergy- Gaseous fuels: Biohydrogen, Biomethane and Microbial fuel cell; Liquid fuels: Bioethanol, Biodiesel and Biobutanol, Aerobic and Anaerobic wastewater treatment processes	Introduction, Microbes and enzymes of industrial importance, Different types of bioreactors and bioreactor design, Microbial growth, substrate degradation and product formation kinetics, Instrumentation, Sterilization of air, media and reactor, Upstream and Downstream processing, Production of Oxy Chemicals I: Tax and non-tax alcohol, Brewing industry, Production of Oxy Chemicals II: Wine making, Vinegar and citric acid production, Production of Oxy Chemicals III: Antibiotics: Penicillin; Streptomycin, High fructose corn syrup, Cheese making, and Single cell production, Vaccines production and Metal leaching, Bioenergy- Gaseous fuels: Biohydrogen, Biomethane and Microbial fuel cell; Liquid fuels: Bioethanol, Biodiesel and Biobutanol, Aerobic and Anaerobic wastewater treatment processes.


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Annexure-I: M.Tech Biotechnology structure (with all Courses) containing following categorization

S.NO.	Course category	Course Code	Course Name	Short Name	L	T	P	S	CH	CR	Pre-requisite	New Course/ Revised Course/ Retained Course	Changes Proposed by	Focused on Employability/ Entrepreneurship/ Skill Development
1	ESC	25BT5124	MATHEMATICS AND BIOSTATISTICS	MBIS	2	2	0	0	4	4	NIL	RETAINED COURSE		EMPLOYABILITY
2	AUC	25UC5201	PROFESSIONAL COMMUNICATION SKILLS	PCS	0	0	4	0	0	4	NIL	RETAINED COURSE		
3	ESC	25BT5111	BIOREACTOR MODELLING AND SIMULATION	BMS	2	2	0	0	4	4	NIL	REVISED COURSE	INDSTRY PEERS	EMPLOYABILITY
4	OE		OPEN ELECTIVE	OE	3	0	0	0	3	3	NIL	RETAINED COURSE		
5	PCC	25BT5121	BIOCHEMICAL ENGINEERING	BCE	3	0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
6	PCC	25BT5122	MOLECULAR BIOLOGY & r-DNA TECHNOLOGY	MG&rDNAT	2	0	2	4	4	8	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
7	PCC	25BT5125	APPLIED BIOINFORMATICS	ABI	3	0	2	0	4	5	NIL	RETAINED COURSE		SKILL DEVELOPMENT
8	PCC	25BT5225	IMMUNOTECHNOLOGY	IMMT	2	0	2	0	3	4	NIL	REVISED COURSE	ACADEMIC PEERS	SKILL DEVELOPMENT
9	PCC	25BT5226	DOWNSTREAM PROCESSING	DSP	3	0	2	0	4	5	NIL	REVISED COURSE	ALUMNI	SKILL DEVELOPMENT
10	PRI	25IE5201	ESSENTIALS OF RESEARCH DESIGN	ERD	2	0	0	0	0	2	NIL	RETAINED COURSE		EMPLOYABILITY
12	PRI	25IE5149	TERM PAPER	TP	0	0	8	0	4	8	NIL	RETAINED COURSE		SKILL DEVELOPMENT
14	PRI	25IE6150	DISSERTATION	PR	0	0	32	0	16	24	NIL	RETAINED COURSE		SKILL DEVELOPMENT
16	PRI	25IE6250	DISSERTATION	DIS	0	0	32	0	16	24	NIL	RETAINED COURSE		SKILL DEVELOPMENT
18	VAC		BASE SAS	SAS	2	0	0	0	0	2	NIL	RETAINED COURSE		EMPLOYABILITY



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19	VAC		REGULATORY AFFAIRS AND CLINICAL TRIALS	RA&CT	2	0	0	0	0	2	NIL	RETAINED COURSE		EMPLOYABILITY
20	PE1	25BT51J1	BIOREACTOR OPERATIONS	BO	2	0	2	0	3	4	BCE	RETAINED COURSE		SKILL DEVELOPMENT
21	PE1	25BT51J2	BIOPROCESS VALIDATION AND cGMP	BV&cGMP	2	0	2	0	3	4	BCE	RETAINED COURSE		SKILL DEVELOPMENT
22	PE1	25BT51J3	ENZYME SCIENCE AND TECHNOLOGY	EST	2	0	2	0	3	4	BCE	RETAINED COURSE		SKILL DEVELOPMENT
25	PE2	25BT52K1	BIOMATERIALS & TISSUE ENGINEERING	BM&TE	2	0	2	0	3	4	MG&rDNAT	RETAINED COURSE		SKILL DEVELOPMENT
24	PE2	25BT52K2	BIOSIMILLAS	BS	2	0	2	0	3	4	MG&rDNAT	RETAINED COURSE		SKILL DEVELOPMENT
25	PE2	25BT52K3	ADVANCED STEM CELL TECHNOLOGY	SCT	2	0	2	0	3	4	MG&rDNAT	RETAINED COURSE		SKILL DEVELOPMENT
26	PE3	25BT52L1	ADVANCED MOLECULAR MODELLING AND DRUG DESIGN	MMDD	3	0	2	0	4	5	ABI	RETAINED COURSE		SKILL DEVELOPMENT
27	PE3	25BT52L2	NGS SEQUENCING AND DATA ANALYSIS	NGS	3	0	2	0	4	5	ABI	RETAINED COURSE		SKILL DEVELOPMENT
28	PE3	25BT52L3	PYTHON AND R PROGRAMMING	P&RP	3	0	2	0	4	5	ABI	RETAINED COURSE		SKILL DEVELOPMENT
29	PE4	25BT52M1	GENOMICS AND PROTEOMICS	GP	3	0	0	0	3	3	IMMT	RETAINED COURSE		EMPLOYABILITY
30	PE4	25BT52M2	INTELLECTUAL PROPERTY RIGHTS, BIOSAFETY AND BIOETHICS	IPR	3	0	0	0	3	3	IMMT	RETAINED COURSE		EMPLOYABILITY
31	PE4	25BT52M3	PROTEIN ENGINEERING	PE	3	0	0	0	3	3	IMMT	RETAINED COURSE		EMPLOYABILITY
32	PE5	25BT53N1	FOOD TECHNOLOGY	FT	3	0	0	0	3	3	MG&rDNAT	RETAINED COURSE		EMPLOYABILITY
33	PE5	25BT53N2	NANOBIOTECHNOLOGY	NBT	3	0	0	0	3	3	MG&rDNAT	RETAINED COURSE		EMPLOYABILITY
34	PE5	25BT53N3	SYNTHETIC BIOLOGY	SB	3	0	0	0	3	3	MG&rDNAT	RETAINED COURSE		EMPLOYABILITY

Percentage of Syllabus Revision= $4 \times 100 / 34 = 11.76\%$

Percentage of Courses focusing on Employability= $11 \times 100 / 34 = 32.35\%$

Percentage of Courses focusing on Skill Development = $17 \times 100 / 34 = 50\%$

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Annexure: II

DATE: 05/08/2025

DEPARTMENT OF BIOTECHNOLOGY

MINUTES OF XXXXII DEPARTMENT ACADEMIC COMMITTEE MEETING

The Department DAC meeting was conducted on 05/08/2025 at C501 from 4:30PM to 5:00 PM chaired by Dr.V Praveen Kumar, HoD-BT.

The Following members were present for XXXXII DAC meeting.

1. Dr.V.Praveen Kumar, Professor, HoD-BT, Chairman
2. Dr.B V L S Prasad, Professor, Member
3. Dr.Mohamad Arifullah, Professor, Member
4. Dr.Bandaru Srinivas, Assoc.Professor, Member
5. Dr.Ragini Singh, Assoc.Professor, Member
6. Dr.Nadeem Siddiqui, Assoc.Professor, Member
7. Dr.M.Maheswara Reddy, Asst.Professor, Member
8. Dr.G.Siva Reddy, Asst.Professor, Member
9. Dr.P Rajasekhar, Asst.Professor, Member
10. Dr.C Chandrasekhar, Asst.Professor, Deputy HoD, Member
11. Dr.Y V Rajesh, Asst.Professor, Member
12. Dr. G Koteswara Reddy, Asst.Professor, Member
13. Dr. T Uday, Asst.Professor, Member
14. Dr. M Hemalatha, Asst.Professor, Member
15. Dr.B Navyatha, Asst.Professor, Member
16. Dr.P Manasa, Asst.Professor, Member
17. Dr.Krishna Samantha, Asst.Professor, Member
18. Dr.Madan Sonkar, Asst.Professor, Member

Member's absent-NIL

Dr. V. Praveen Kumar welcomed all attendees and initiated the discussion of the Department Academic Council meeting. The Chairman then presented the agenda items to the members of the DAC. The following agenda items were placed before the Department Academic Council for consideration.


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AGENDA and RESOLUTIONS

Agenda Item-I

To consider and approve the feedback received from stake holders on the curriculum	Approved and recommended to Board of Studies
--	--

Resolution: After reviewing and analyzing the feedback received from stakeholders regarding the curriculum for the 2025-2026 admitted batch, it was approved in the XXXXII DAC meeting. The same feedback has been forwarded for further consideration and approval by the Board of Studies (BOS). The detailed feedback analysis report is given in **Annexure-I**.

Agenda Item-II

To consider and approve the proposal for launching certificate courses for the 2025-2026 admitted batch.	Approved and recommended to Board of Studies
--	--

Resolution: The following Value Added Courses for the 2025-2026 admitted batches have been introduced and approved by the Departmental Academic Committee (DAC), and are now recommended for further approval by the Board of Studies (BoS).

1. Nano medicine
2. Clinical Data management
3. Pharmacovigilence
4. Regulatory affairs
5. Base SAS
6. NGS Sequencing
7. Medical Coding


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Agenda Item-III

To consider and approve the Program Development Document (PDD) for M.Tech and B.Tech programs, outlining the new program structure with a focus on local, regional, national, and global needs, along with appropriate course mapping.	Approved and recommended to Board of Studies
--	--

Resolution: The Program Development Document (PDD) for M.Tech and B.Tech, reflecting the new program structure with emphasis on local, regional, national, and global needs, along with course mapping, has been approved by the Departmental Academic Committee (DAC) and recommended to the Board of Studies (BoS). The PDD for the 2025-2026 admitted batch is provided in **Annexure-II**.

Agenda Item-IV

To consider and approve the revisions proposed by the course coordinators in syllabus / Course Outcomes /experiments / teaching pedagogies for the courses to be offered in the Academic Year 2025-2026.	Approved and recommended to Board of Studies
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Resolution: The revisions proposed by the course coordinators in the syllabus, course outcomes, experiments, and teaching pedagogies for the courses to be offered to the 2024-2025, 2023-2024, and 2022-2023 admitted batches have been approved by the Departmental Academic Committee (DAC) and recommended to the Board of Studies (BoS). The revised syllabi for these batches are provided in **Annexure-III**.

Agenda Item-IV

To consider and approve the proposed B.Tech and M.Tech program structure for the Y25 batch, including the categorization of courses under Employability, Entrepreneurship, and Skill Development.	Approved and recommended to Board of Studies
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Resolution: The curriculum for the 2025-2026 admitted batches of B.Tech and M.Tech programs has been approved by the Departmental Academic Committee (DAC) and recommended to the Board of Studies (BoS). The detailed course structure for the 2025-2026 admitted batch is provided in **Annexure-IV**.


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Agenda Item-V

To consider and approve the CO-PO attainment of 2024-2025 academic year.	Approved and recommended to Board of Studies
--	--

Resolution: The CO-PO attainment for the 2024-2025 academic year batches has been approved by the Departmental Academic Committee (DAC) and recommended to the Board of Studies (BoS). The detailed CO-PO attainment report for the 2024-2025 batches is provided in AnnexureV.


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The following members have attended the XXXXII Department Academic council (DAC) meeting held on 05/08/2024 at C501 from 4:30pm to 5:00pm.

S.No	FULL NAME	DESIGNATION	ORGANIZATION	POSITION IN THE MEETING	SIGNATURE
1	Dr.V. Praveen Kumar	Professor & HOD	Biotechnology	Chairman	
2	Dr.B V L S Prasad	Professor	Biotechnology	Internal member	B V L S
3	Dr.Mohammed Arifullah	Professor	Biotechnology	Internal member	Arifullah
4	Dr.Bandaru Srinivas	Assoc. Professor	Biotechnology	Internal member	Bandaru
5	Dr.Ragini Singh	Assoc. Professor	Biotechnology	Internal member	Ragini
6	Dr.Nadeem Siddiqui	Assoc. Professor	Biotechnology	Internal member	Nadeem
7	Dr.M.Maheswara Reddy	Asst. Professor	Biotechnology	Internal member	
8	Dr.G.Siva Reddy	Asst. Professor	Biotechnology	Internal member	G S
9	Dr.Y V Rajesh	Asst. Professor	Biotechnology	Internal member	Rajesh
10	Dr.T Uday	Asst. Professor	Biotechnology	Internal member	Uday
11	Dr.B Navyatha	Asst. Professor	Biotechnology	Internal member	Navyatha
12	Dr.P Rajasekhar	Asst. Professor	Biotechnology	Internal member	Raja
13	Dr.C Chandrasekhar	Alternate Head & Asst. Professor	Biotechnology	Internal member	chandra

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14	Dr.M Hemalatha	Asst. Professor	Biotechnology	Internal member	Hema
15	Dr.Madan Sonkar	Asst. Professor	Biotechnology	Special Invitee	Madan
16	Dr. Krishna Samantha	Asst. Professor	Biotechnology	Special Invitee	Samantha
17	Dr.G Koteswara Reddy	Asst. Professor	Biotechnology	Internal member	Kotem
18	Dr.P Manasa Naik	Asst. Professor	Biotechnology	Special Invitee	Manasa
19	Ms. K Jwalitha-2200010098	Fourth Year Student	Biotechnology	Member	Jwala
20	Ms. P Venkata Naga Anusha Sri-230010087	Third Year Student	Biotechnology	Member	Anusha
21	Mr. M Pavan Sai 2400010025	Second Year Students	Biotechnology	Member	Pavan

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Annexure: III

COURSE CODE	NAME OF THE COURSE	PAPER	L	T	P	S
25RES104	RESEARCH METHODOLOGY	PAPER-I	4	0	0	0
25BT201	BIOANALYTICAL TECHNIQUES	PAPER-II	3	0	0	0
25BT202	BIOPROCESS ENGINEERING	PAPER-III	3	0	0	0
25BT203	MOLECULAR BIOLOGY & rDNA TECHNOLOGY	PAPER-III	3	0	0	0
25BT204	MOLECULAR MODELLING AND DRUG DESIGN	PAPER-III	3	0	0	0
25BT205	PLANT BIOTECHNOLOGY	PAPER-III	3	0	0	0
25BT206	ENVIRONMENTAL BIOTECHNOLOGY	PAPER-III	3	0	0	0
25BT207	MICROBIAL TECHNOLOGY	PAPER-III	3	0	0	0
25BT208	BIOCHEMISTRY	PAPER-III	3	0	0	0
25BT209	IMMUNOTECHNOLOGY	PAPER-III	3	0	0	0
25BT210	NANOBIOTECHNOLOGY	PAPER-III	3	0	0	0
25BT211	INDUSTRIAL BIOTECHNOLOGY	PAPER-III	3	0	0	0

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Annexure: IV

S.NO.	COURSE CAT	Course Code	Course Name	L	T	P	S	CH	CR	Pre-requisite
1	SDC	24SDBT01	MEDICAL LABORATORY TECHNOLOGY	1	0	0	4	2	5	NIL
2	SDC	24SDBT02	PROCESS ENGINEERING TOOLS	1	0	0	4	2	5	NIL
3	SDC	24SDBT03	COMPUTER AIDDED DRUG DESIGN	1	0	0	4	2	5	NIL
4	SDC	24SDBT04	ASPECTS OF BIOCHEMICAL ENGINEERING	1	0	0	4	2	5	NIL
5	SDC	24SDBT05	DRUG DESIGN: PRINCIPLES AND ENGINEERING	1	0	0	4	2	5	NIL
6	SDC	24SDBT06	CELL CULTURE TECHNOLOGIES	1	0	0	4	2	5	NIL
7	SDC	24SDBT07	MASS SPECTROMETRY BASED PROTEOMICS	1	0	0	4	2	5	NIL
8	SDC	24SDBT08	ANIMAL PHYSIOLOGY	1	0	0	4	2	5	NIL


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ANNEXURE V: STAKEHOLDERS FEEDBACK ACTION TAKEN REPORT FOR XXXXII BOS

Stakeholder Category	Peer's Name with Designation and Affiliation	Stakeholder Feedback / Recommendation	Action Taken
Industry Personnel	Dr. Ram Gopal, Senior Academic Manager from Biocon Pvt Ltd, Bangalore	It is suggested to include the ABO Blood Grouping Test, WIDAL Test, Clotting Time Test, and estimation of blood glucose levels using a glucose meter in the Medical Laboratory Technology course for the 2025–26 admitted batch.	ABO Blood Grouping Test, WIDAL Test, Clotting Time Test, and estimation of blood glucose levels using a glucose meter have been included in the Medical Laboratory Technology course for the 2025–26 admitted batch.
Industry Personnel	Dr. Vamshi Velishala, Engineer, Scientific R&D team, Thermo Fischer, Bangalore	It is suggested to incorporate the topic 'Production, Optimization, and Application in Plant Probiotics—Optimization of Biosurfactant Production Using Response Surface Methodology (RSM)' into the Process Engineering Tools course for the 2025–26 batch.	Production, optimization, and application in plant probiotics—specifically the optimization of biosurfactant production using response surface methodology (RSM)—were added to the Process Engineering Tools course for the 2025–26 batch.
Industry Personnel	Dr. Rakesh Goud Vasker, Senior Manager	It is suggested to incorporate 'Advancements in Molecular Modelling and Drug Design,' including new technologies and innovations in drug design, as well as applications of computer-aided drug design with real-world examples, into the Computer Aided Drug Design course for the 2025–2026 admitted batch.	Advancements in molecular modelling and drug design—including new technologies and innovations, as well as the application of computer-aided drug design with real-world examples—were incorporated into the Computer Aided Drug Design course for the 2025–2026 curriculum.
Industry Personnel	Dr. Ratna Sudha, CEO, Unique Biotech Pvt Ltd, Hyderabad	It is suggested to include topics on Bioprocess Control and Optimization in the Aspects of Biochemical Engineering course for the 2025–2026 admitted batch, covering process control parameters such as pH, temperature, and oxygen transfer, sensors and automation; fermentation technology including batch, fed-batch, and continuous processes; optimization techniques like response surface methodology and	Bioprocess Control and Optimization, including process control parameters (pH, temperature, oxygen transfer), sensors and automation; fermentation technology covering batch, fed-batch, and continuous processes; optimization techniques such as response surface methodology and Design of Experiments (DOE); and bioreactor sterilization with



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		Design of Experiments (DOE); and bioreactor sterilization along with contamination control methods and mitigation strategies..	contamination risks and mitigation methods were included in the Aspects of Biochemical Engineering course for the 2025–26 batch.
Industry Personnel	Dr. Jayanthi, Head, Scientific Affairs, Unique Biotech Pvt Ltd, Hyderabad	It is suggested to include topics on Drug Development and Optimization in the Drug Design: Principles and Engineering course for the 2025–26 admitted batch, covering lead optimization for improved efficacy and reduced toxicity, ADMET properties assessment, prodrug design strategies to enhance drug delivery and bioavailability, and an overview of chemical and biological synthesis of drug candidates.	Drug Development and Optimization, including lead optimization for improved efficacy and reduced toxicity, ADMET properties assessment, prodrug design strategies to enhance drug delivery and bioavailability, and an overview of chemical and biological synthesis of drug candidates, were added to the Drug Design: Principles and Engineering course for the 2025–26 batch.
Industry Personnel	Mr. Bishesh Sahoo, Senior Manager - Lead Operations, Cipla Pharmaceuticals, Maharashtra	It is suggested to include concepts of Advanced Cell Culture Technologies in the Cell Culture Technology course for the 2025–26 admitted batch, covering 3D cell culture techniques such as spheroids, organoids, and bioprinting; microfluidics and lab-on-a-chip applications for cell culture and analysis; stem cell and gene therapy applications in regenerative medicine; and ethical considerations related to stem cells, genetic modifications, and biopharmaceuticals.	Concepts of Advanced Cell Culture Technologies—including 3D cell culture techniques such as spheroids, organoids, and bioprinting; microfluidics and lab-on-a-chip applications; stem cell and gene therapy applications; and ethical considerations related to stem cells, genetic modifications, and biopharmaceuticals—were included in the Cell Culture Technology course for the 2025–26 batch.
Industry Personnel	Miss Shivani Dharbe, Analytical Scientist at Reddy's Lab, Hyderabad	It is suggested to include advanced topics in proteomics—such as single-cell proteomics, spatial proteomics, proteogenomics integration, and emerging trends—along with a laboratory component providing hands-on training in protein extraction, SDS-PAGE, trypsin digestion, LC-MS/MS data interpretation, and database searching in the Mass Spectrometry Based Proteomics course for the 2025–26 admitted batch.	The application of advanced topics in proteomics—including single-cell proteomics, spatial proteomics, proteogenomics integration, and emerging trends—along with a laboratory component involving hands-on training in protein extraction, SDS-PAGE, trypsin digestion, LC-MS/MS data interpretation, and database searching, was added to the Mass



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			Spectrometry Based Proteomics course for the 2025–26 batch.
Industry Personnel	Mr. Nayab Rassol Khan	It is suggested to include topics such as Integrative Physiology and Applications—covering the application of animal physiology in pharmacology, toxicology, and biotechnology—as well as an introduction to animal models in research in the Animal Physiology course for the 2025–26 admitted batch.	Integrative Physiology and Applications—including the use of animal physiology in pharmacology, toxicology, and biotechnology—as well as an introduction to animal models in research were included in the Animal Physiology course for the 2025–26 batch.
Industry Personnel	Dr. Sri Krishna Pawar, Senior Manager, Sanofi GOA	It is suggested to include Advanced Bioreactor Technologies, Applications of Bioreactors, Environmental and Economic Considerations, and Future Trends in Bioreactor Technologies in the Bioreactor Operations course for the 2025–26 admitted batch.	Advanced Bioreactor Technologies, Applications of Bioreactors, Environmental and Economic Considerations, and Future Trends in Bioreactor Technologies were included in the Bioreactor Operations course for the 2025–26 batch.
Industry Personnel	Mr. Vishal Dhawan, MD, Synapse Labs Pvt Ltd	Suggested to include Applications and Future Trends in Computational Biology in the Computational Biology course for the 2025–26 admitted batch, covering applications in drug discovery such as identifying drug targets and optimizing lead compounds; personalized medicine focusing on genomics-driven individualized treatment strategies; machine learning techniques and their applications in biological data analysis; and ethical considerations related to computational biology in research and clinical settings.	Applications and future trends in computational biology—including drug discovery through identification of drug targets and lead optimization, personalized medicine based on genomics, machine learning techniques for biological data analysis, and ethical considerations in research and clinical applications—were added to the Computational Biology course for the 2025–26 batch.
Academic Personnel	Dr. Asim Bikas, NIT Warangal, Rajasthan	It is suggested to include topics on drug manufacturing processes—covering good manufacturing practices, manufacturing facilities, sources of	Drug manufacturing processes—including good manufacturing practices, manufacturing facilities, sources of biopharmaceuticals, and



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		biopharmaceuticals, and production and analysis of biopharmaceuticals—in the Pharmaceutical Biotechnology course for the 2025–26 admitted batch.	production and analysis of biopharmaceuticals—were incorporated into the Pharmaceutical Biotechnology course for the 2025–26 batch.
Academic Personnel	Dr. B N Singh, Manipal Institute of Technology, Karnataka	It is suggested to include topics on stem cells and biopharming, genetic manipulation of stem cells, ethics of human cell research including immortal cells and moral selves, ethical considerations in stem cell-based therapies, and FDA products and preclinical regulatory considerations in the Stem Cell Technology course for the 2025–26 admitted batch.	Stem cells and biopharming, genetic manipulation of stem cells, ethics of human cell research including immortal cells and moral selves, ethical considerations in stem cell-based therapies, and FDA products and preclinical regulatory considerations were added to the Stem Cell Technology course for the 2025–26 batch.
Academic Personnel	Dr. Rajeswar Reddy, NIT AP	It is advised to revise the L-T-P-S structure of skill-based courses from 0-0-2-4 to 1-0-0-4 for the 2024–2025 admitted batch to enhance students' conceptual understanding of practical and skill components through the inclusion of a lecture component.	The L-T-P-S structure of skill-based courses was revised from 0-0-2-4 to 1-0-0-4 for the 2024–2025 batch to improve conceptual understanding through added lecture components. The change was approved, course content updated, faculty assigned, and the timetable adjusted. Orientation was provided, and feedback mechanisms have been set up to monitor the effectiveness of the new structure.
Academic Personnel	Dr. Pragyan Ranjan Rout, NIT Jalandhar Faculty	It is recommended to provide an option for revision or modification of course outcomes and Bloom's Taxonomy Levels (BTL) in their respective courses for the 2025–26 admitted batch.	Faculty were given the option to revise course outcomes and Bloom's Taxonomy Levels (BTL) for the 2025–26 batch.

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Academic Personnel	Dr. Dig Vijay Singh, MAHE, Karnataka	It is suggested to include emerging technologies in Biomedical Informatics in the Biomedical Informatics course for the 2025-26 admitted batch, covering topics such as big data and its impact on healthcare, the role of mobile health (mHealth) and wearable technologies, telemedicine and remote patient monitoring, applications of blockchain for healthcare data security, future trends including AI, precision medicine, and biomedical research, along with case studies on innovations in healthcare informatics.	Emerging technologies in Biomedical Informatics—including big data and its impact on healthcare, the role of mobile health (mHealth) and wearable technologies, telemedicine and remote patient monitoring, applications of blockchain in healthcare data security, future trends such as AI, precision medicine, and biomedical research, and case studies on innovations in healthcare informatics—were included in the Biomedical Informatics course for the 2025-26 batch.
Academic Personnel	Dr. Mahesh Kumar Sah, NIT Jalandhar	It is suggested to conduct more skill-based experiments for the 2025-26 admitted batch.	More skill-based experiments were introduced for the 2025-26 batch.
Academic Personnel	Dr. Taskin Mohammad, Professor, NRI Medical College	It is suggested to increase the number of industrial visits for the 2025-26 admitted batch.	The number of industrial visits was increased for the 2025-26 batch.
Academic Personnel	Dr. Lakshmi Prasuna, NIT Bhopal	It is suggested to add topics on Applications and Future Trends of Genetic Programming in the Genetic Programming course for the 2025-26 admitted batch, including applications in finance, engineering, and bioinformatics; genetic programming for automated software development; its use in autonomous systems and robotics; future directions such as quantum computing integration; ethical considerations and challenges; and case studies highlighting cutting-edge applications and innovations.	Applications and future trends of Genetic Programming—including its use in finance, engineering, and bioinformatics; automated software development; autonomous systems and robotics; future directions such as quantum computing integration; ethical considerations and challenges; and case studies on cutting-edge innovations—were added to the Genetic Programming course for the 2025-26 batch.

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Academic Personnel	Dr. Sirsendu Ray, NIT Rourkela	It is suggested to include design examples on continuous fermentation, aeration, and agitation; design calculations for air sterilization filters, batch and continuous sterilizers, and immobilized enzyme kinetics; practical considerations in bioreactor/fermenter construction; design exercises on trickle flow fermenters; and problems associated with design equations in the Bioprocess Economics and Plant Design course for the 2025–26 admitted batch.	Design examples on continuous fermentation, aeration, and agitation; design calculations for air sterilization filters, batch and continuous sterilizers, and immobilized enzyme kinetics; practical considerations in bioreactor/fermenter construction; design exercises on trickle flow fermenters; and problems associated with design equations were added to the Bioprocess Economics and Plant Design course for the 2025–26 admitted batch.
Academic Personnel	Dr. Amit Srivastava, IIT BHU, UP	It is suggested to include topics on enzyme reactors and enzyme kinetics in the Biochemical Reaction Engineering course for the 2025–26 admitted batch.	Enzyme reactors and enzyme kinetics were included in the Biochemical Reaction Engineering course for the 2025–26 batch.
Alumni	Ms. Navyatha, MNNIT Bhopal	It is suggested to include concepts such as mechanisms of enzyme degradation through lysosomal and non-lysosomal pathways with relevant examples; applied enzymology including industrial enzymes, enzymes used in various fermentation processes, clinical enzymes, and isoenzymes; enzyme immobilization, ELISA, biosensors; enzyme engineering and site-directed mutagenesis; and designer enzymes in the Enzyme Engineering course for the 2025–26 admitted batch.	Concepts such as mechanisms of enzyme degradation through lysosomal and non-lysosomal pathways with examples; applied enzymology covering industrial enzymes, enzymes used in fermentation processes, clinical enzymes, and isoenzymes; enzyme immobilization, ELISA, biosensors; enzyme engineering, site-directed mutagenesis, and designer enzymes were added to the Enzyme Engineering course for the 2025–26 batch.
Alumni	Ms. Bhavana Poladi, South Carolina, USA	It is suggested to add topics under Production of Oxy Chemicals III—such as antibiotics (Penicillin, Streptomycin), high fructose corn syrup, cheese making, single-cell protein production, and vaccine production—in the Bioprocess Engineering course for the 2025–26 admitted batch.	Production of Oxy Chemicals III—including antibiotics such as Penicillin and Streptomycin, high fructose corn syrup, cheese making, single-cell protein production, and vaccine production—was added to the Bioprocess Engineering course for the 2025–26 batch.



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Alumni	Miss. Yochana Bodepalli, North Texas, USA	It is suggested to add unit operations—drying, evaporation, extraction, adsorption, leaching, and crystallization—in the Transport Process in Biological Systems course for the 2025–26 admitted batch.	Unit operations—drying, evaporation, extraction, adsorption, leaching, and crystallization—were added to the Transport Process in Biological Systems course for the 2025–26 admitted batch.
Alumni	Miss. Kamujula Vandana, Ottawa, Canada	Suggested that the emphasis on internships abroad be enhanced for the 2025-26 admitted batch.	Emphasis on abroad internships was enhanced for the 2025-26 batch.
Alumni	Mr. Nizamuddin Syed, Sydney, Australia	Suggested that students should be encouraged to participate in National level seminars for the 2025-26 admitted batch.	Students were encouraged to participate in National level seminars for the 2025-26 batch.
Alumni	Mr. Harisai Prakash, Manager, ZIFO Biotech Company	Suggested to make students visit more CSIR Labs for the 2025-26 admitted batch.	The number of CSIR lab visits for students was increased for the 2025-26 batch.
Alumni	Ms. Laasya Sri, Novartis, Hyderabad	Suggested to increase foreign language courses starting from the second year for the 2025-26 admitted batch.	Foreign language courses were increased from the second year for the 2025-26 batch.
Students	Ms. Palak Singh	Suggested covering the core topics of the GATE syllabus in the curriculum for the 2025-26 admitted batch.	Core topics of the GATE syllabus were included in the curriculum for the 2025-26 batch.
Students	Mr. Harsha	Suggested allowing students to go for more industrial tours to explore the manufacturing of various products for the 2025-26 admitted batch.	More industrial tours were arranged for the 2025-26 batch.

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Students	Mr. Suresh Kancham	Suggested increasing the number of industrial visits for the 2025-26 admitted batch.	The number of industrial visits was increased for the 2025-26 batch.
Students	Miss. Vaagdevi	Suggested implementing the "Industrial Visit" program for any food-related industries for the 2025-26 admitted batch.	The "Industrial Visit" program was implemented for food-related industries for the 2025-26 batch.
Parents	Mr. Subhash Pal	Suggested enhancing the practical knowledge of students by increasing lab experiments for the 2025-26 admitted batch.	More lab experiments were introduced for the 2025-26 batch.
Parents	Mrs. Sukanya Vemuri	Suggested conducting more hands-on experiments and allowing students to do more lab work for the 2025-26 admitted batch.	More hands-on experiments and lab work opportunities were provided for the 2025-26 batch.
Parents	Mrs. Fareeha Shaikh	Suggested encouraging abroad internships for students with good academic records for the 2025-26 admitted batch.	Abroad internships were encouraged for students with good academic records for the 2025-26 batch.
Parents	Mr. Jonnalgadda Vinay	Suggested conducting more skill-based experiments for the 2025-26 admitted batch.	More skill-based experiments were added for the 2025-26 batch.
Parents	Mr. Umesh Raj	Suggested improving lectures from industrial experts for better learning skills for the 2025-26 admitted batch.	Lectures from industrial experts were improved for the 2025-26 batch.

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Parents	Mrs. Siddique Begum	Suggested increasing the series of foreign lectures for proper skills development for the 2025-26 admitted batch.	The series of foreign lectures was increased for the 2025-26 batch.
Parents	Mr. Saleem Khan	Suggested including foreign internships from the second year onwards for the 2025-26 admitted batch.	Foreign internships were included from the second year for the 2025-26 batch.
Parents	Mr. J Vinay	Suggested improving lectures from eminent people for the 2025-26 admitted batch.	Lectures from eminent people were enhanced for the 2025-26 batch.
Faculty	Dr. G Siva Reddy	Suggested including skill-based experiments on Bioreactor operations for the 2025-26 admitted batch.	Skill-based experiments on Bioreactor operations were added for the 2025-26 batch.
Faculty	Dr. Mahesh Reddy	Suggested including CCD in the Fermentation Technology course for the 2025-26 admitted batch.	CCD was incorporated in the Fermentation Technology course for the 2025-26 batch.
Faculty	Dr.M Nageswara Rao	Suggested including Drug release kinetics in Pharmaceutical Technology for the 2025-26 admitted batch.	Drug release kinetics were included in Pharmaceutical Technology for the 2025-26 batch.
Faculty	Dr.T Uday	Suggested including Marine Biotechnology topics in the Industrial specialization courses for the 2025-26 admitted batch.	Marine Biotechnology topics were added in Industrial Specialization courses for the 2025-26 batch.

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Faculty	Dr.G Koteswara Rao	Suggested adding iontophoretic drug delivery in Pharmaceutical Biotechnology for the 2025-26 admitted batch.	Iontophoretic drug delivery was added in Pharmaceutical Biotechnology for the 2025-26 batch.
Faculty	Dr. C Chandrasekhar	Suggested including 3D Bio printing in Tissue Engineering for the 2025-26 admitted batch.	3D Bio printing was included in Tissue Engineering for the 2025-26 batch.


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ANNEXURE VI: SYLLABUS REVISION

Course Code: 24BT1202 **Course Title:** Biochemical Thermodynamics **L-T-P-S:** 3-1-0-0

Course Objective: Biochemical thermodynamics aims to provide students with a solid foundation in the principles of thermodynamics and their application to biological systems. This knowledge is essential for understanding the energetics of biochemical processes and has broad implications for various scientific and industrial fields.

Course Rationale: Biochemical thermodynamics focuses on providing students with a deep understanding of the fundamental principles and concepts related to the thermodynamics of biochemical processes

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
The first law and other basic concepts: Joule's experiments, internal energy, the first law of thermodynamics, thermodynamics state and state functions, enthalpy, the steady state, Steady flow process, equilibrium, the phase rule, the reversible process, constant V and constant P processes, heat capacity. Heat effects: Sensible heat effects, internal energy of ideal gases, microscopic view, latent heats of pure substances, standard heat of reaction, standard heat of formation, standard heat of combustion. The second law of Thermodynamics: Statement of the second law, heat engines, thermodynamic temperature scales, ideal gas scale, entropy, entropy changes of an ideal gas, mathematical statement of second law, the third law of Thermodynamics, entropy from the microscopic viewpoint. Thermodynamic properties of fluids: Property relations for homogeneous phases, residual properties, Solution thermodynamics: partial properties, concepts of chemical potential and fugacity, ideal and non-ideal solutions, Gibbs-Duhem equation, excess properties of mixture, activity coefficients, activity coefficients correlations. Criteria for phase equilibria: Vapour-liquid equilibrium calculations for binary mixtures, Liquid-liquid equilibria and solid liquid equilibria, Chemical reaction equilibria.	The first law and other basic concepts: Joule's experiments, internal energy, the first law of thermodynamics, thermodynamics state and state functions, enthalpy, the steady state, Steady flow process, equilibrium, the phase rule, the reversible process, constant V and constant P processes, heat capacity. Heat effects: Sensible heat effects, internal energy of ideal gases, microscopic view, latent heats of pure substances, standard heat of reaction, standard heat of formation, standard heat of combustion. The second law of Thermodynamics: Statement of the second law, heat engines, thermodynamic temperature scales, ideal gas scale, entropy, entropy changes of an ideal gas, mathematical statement of second law, the third law of thermodynamics, entropy from the microscopic viewpoint. Thermodynamic properties of fluids: Property relations for homogeneous phases, residual properties, Solution thermodynamics: partial properties, concepts of chemical potential and fugacity, ideal and non-ideal solutions, Gibbs-Duhem equation, excess properties of mixture, activity coefficients, activity coefficients correlations. Criteria for phase equilibria: Vapour-liquid equilibrium calculations for binary mixtures, Liquid-liquid equilibria and solid liquid equilibria, Chemical reaction equilibria. Biochemical thermodynamics: Energetics of metabolic pathways, Energy coupling (ATP & NADH), Energetic analysis of cell growth and product formation. Thermodynamics of microbial growth, oxygen consumption and heat evolution in aerobic cultures, energy balance equation for cell culture, reaction thermodynamics.

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Course Code: 24BT2103

Course Title: Biochemistry

L-T-P-S: 3-0-2-0

Course Objective: A biochemistry course provides students with a deep understanding of the chemical basis of life, preparing them for careers in a wide range of fields and equipping them with the knowledge and skills needed to contribute to scientific advancements and innovation.

Course Rationale: The course rationale of biochemistry is based on the recognition of its crucial role in understanding the fundamental chemical processes and molecules that drive life.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Carbohydrates: Introduction to biomolecules; types of linkages/bonds; importance of biomolecules; Classification, structure and functions of monosaccharides (glyceraldehyde, ribose, glucose, galactose and fructose), disaccharides (maltose, lactose and sucrose); polysaccharides (starch, cellulose, glycogen) and heteropolysaccharides (hyaluronic acid and chondroitin sulfate). Amino acids and proteins: Amino acid structures, three and one letter nomenclature, classification, biological properties of amino acids; physicochemical properties, reactions of amino acids; Importance of proteins in biological systems; primary, secondary, tertiary and quaternary structure and proteins. Synthesis of Peptides (solid phase peptide synthesis); Lipids Classification; Structure; physicochemical properties of different classes of lipids. Nucleic acids: Structure; properties and biological functions of nucleic acids. Types of DNA and RNA. Metabolism: Introduction, IUBN Classification of enzymes, role of vitamins and coenzymes; basic metabolic pathways; glycolysis, Krebs cycle, Electron Transport Chain, Beta oxidation of fatty acids.	Water & pH- Water and its unusual properties, non-covalent interactions, role in biological processes; pH, weak acids, and weak bases, Henderson-Hasselbalch equation for pH and pKa; biological buffers: Introduction and buffering against pH changes in Biological Systems. Amino acids and Metabolism: Classification and properties, pKa and pI values of amino acids, biosynthesis of amino acids; Biodegradation of amino acids: Deamination, transamination, Urea Cycle. Peptide & Protein: peptide bond and pI values of peptides, solid-phase peptide synthesis, Ramachandran plot, structural organization of proteins, protein stability and folding, native structure of protein (Myoglobin, Hemoglobin and collagen), conjugated proteins. Enzymes: nomenclature and classification of enzymes, enzyme kinetics (Michaelis-Menten and Lineweaver-Burk plot), factors affecting enzyme activity, cofactor, coenzymes and allosteric modulators, enzyme inhibition and types. Carbohydrates and Bioenergetics: Classification, structure, properties and functions of monosaccharides, disaccharides and polysaccharides (homopolysaccharides and heteropolysaccharides). Ring structure and mutarotation, stereo isomers and structural isomers. Principle of bioenergetics and introduction to cellular thermodynamics. Glycolysis & oxidation of Pyruvate, Krebs (TCA) cycle, Pentose phosphate pathway, Gluconeogenesis, electron transport and Oxidative phosphorylation. Lipid: Fats and lipids – Classification, structure and function: simple, compound & derived lipids, Essential fatty acids. Metabolism of lipids: Fatty acid synthesis, origin of acetyl-Co A for fat synthesis, Elongation & desaturation of Fatty Acids. Activation & transport of fatty acid to mitochondria, β-Oxidation of saturated & unsaturated fatty acids. Nucleic acid: Structure and properties Purines and pyrimidines. Structural basis of DNA and RNA, types and functions of DNA and RNA. Metabolism of Nucleotides: Purines & Pyrimidines synthesis: de Novo & salvage pathway, Conversion of nucleoside monophosphates to nucleoside triphosphates, Formation of deoxyribonucleotides. Catabolism & salvage of Purine and Pyrimidine nucleotides. Vitamins and hormones: Vitamins: Definition, classification, chemistry, functions of vitamins. Hormones: outlines of hormones and their functions in cellular signaling and regulation of metabolic pathways. Deficiency and disorders associated with vitamins and hormones.

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Department of Biotechnology

Course Code: 24BT3214 Course Title: Fermentation Technology

L-T-P-S: 3-0-2-0

Course Objective: Fermentation technology aims to prepare students for careers in various industries by providing a strong foundation in the principles and applications of fermentation processes while considering their relevance in today's world.

Course Rationale: Fermentation technology typically focus on providing students with a comprehensive understanding of the principles, processes, and applications of fermentation in various industries, including biotechnology, food and beverage, pharmaceuticals, and bio fuel production.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Fermentation: Different range of fermentation processes; Chronological development of fermentation industry; General requirements of fermentation processes; an overview of aerobic and anaerobic fermentation process, Monitoring and control of fermentation process. Ancillary fittings for reactors (sampling port); Aseptic transfer of spore suspension. Medium requirements for fermentation processes Carbon, Nitrogen, Minerals, Vitamins and Other Complex nutrients, Oxygen requirement. Fermentation Processes & Sterilization Techniques: Classification of fermentation system (Batch, fed-batch, Continuous); Solid state fermentation, Submerged fermentation. Dual and multiple fermentations; Concept of Chemostat; Turbidostat, Kinds of sterilization techniques; Thermal death kinetics of microorganisms, Batch and Continuous sterilization of liquid media, Filter sterilization. Aeration and Agitation: Types of mixing mechanisms- bubble aeration & mechanical agitation; mixing equipment; Types of spargers and impellers in fermenters; Significance of oxygen transfer in fermentations; Factors affecting oxygen transfer rates. Scale up of fermentation process; Principles; Theoretical considerations and techniques used; Scale down methods; Industrial fermentation products- Penicillin, Alcohol production.	Introduction to Fermentation: Different range of fermentation processes; Chronological development of fermentation industry; General requirements of fermentation processes; an overview of aerobic and anaerobic fermentation process, Monitoring and control of fermentation process. Ancillary fittings for reactors (sampling port); Aseptic transfer of spore suspension. Medium requirements for fermentation processes Carbon, Nitrogen, Minerals, Vitamins and Other Complex nutrients, Oxygen requirement. Introduction to medium optimization, Methods of media optimization (One factor method and Plackett-Burman design); Fermentation Processes & Sterilization Techniques: Classification of fermentation system (Batch, fed-batch, Continuous); Solid state fermentation, Submerged fermentation. Dual and multiple fermentations; Concept of Chemostat; Turbidostat, Kinds of sterilization techniques; Thermal death kinetics of microorganisms, Batch and Continuous sterilization of liquid media, Filter sterilization. Aeration and Agitation: Types of mixing mechanisms- bubble aeration & mechanical agitation; mixing equipment; Types of spargers and impellers in fermenters; Significance of oxygen transfer in fermentations; Factors affecting oxygen transfer rates. Scale up of fermentation process; Principles; Theoretical considerations and techniques used; Scale down methods; Industrial fermentation products- Penicillin, Alcohol production.

Head

Department of Biotechnology
Koneru Lakshmaiah Education Foundation
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VADDESWAREM, Guntur Dt.



Koneru Lakshmaiah Education Foundation

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Department of Biotechnology

Course Code: 24BT3213 Course Title: Plant Biotechnology L-T-P-S: 3-0-2-0

Course Objective: The **Plant Biotechnology** course equips students with essential skills in genetic engineering, plant tissue culture, and biotechnology applications, preparing them for roles in R&D, agriculture, and sustainability sectors. It also fosters innovation in plant-based products and prepares students for advanced research and regulatory compliance roles in biotech industries.

Course Rationale: The **Plant Biotechnology** course addresses the growing demand for skilled professionals in biotechnology and agriculture by equipping students with essential skills in genetic engineering, crop improvement, and plant-based innovations. It prepares them for roles in research, sustainability, and industry, while ensuring they understand regulatory and ethical frameworks.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Plant tissue culture: Totipotency of plant tissue; Conservation of plant germplasm; Germplasm preservation-Cryopreservation; Plant Tissue Culture-Sterilization, composition of MS media, Media Preparation; Callus culture, Organogenesis, Somatic embryogenesis, Meristem culture, Haploid production (Anther, Pollen/Ovary, Ovule); Micropropagation, hardening and Green House Technology; Protoplast isolation and fusion- Cybrid Production; Artificial/synthetic seeds; Production of Secondary Metabolites. Genetic engineering in Plants: Agrobacterium-mediated DNA transfer- Ti/Ri plasmid Vectors- Binary and co-integrated vectors; Transformation strategies in plants- Agrobacterium tumefaciens, Physical methods of gene transfer- Electroporation and gene gun methods; Chloroplast transformation; Molecular biology of plant-pathogen interactions and application of gene transfer techniques in pest resistance (Bt genes), edible vaccines, and Delayed fruit ripening; Ethical issues in plant biotechnology. Animal cell culture: Facilities and Applications- Media for Animal cells; Types of cell culture- Primary cell culture, secondary culture, cell transformation, cell lines, Insect cell lines, stem cell cultures, cell viability, and cytotoxicity; Biology of cultured cells, measurement of growth, cell synchronization, senescence, and apoptosis; Organ culture; Cryopreservation; Human embryonic Stem Cells. Genetic engineering in animals: methods of DNA transfer into animal cells- calcium phosphate co-precipitation, microinjection, electroporation, Liposome encapsulation, Biological vectors. Hybridoma technology; Vaccine production; Transgenic animals-Merits and demerits; Cloning of Dolly, Animal Pharming, Regenerative Medicine, Ethical issues in animal biotechnology	Plant tissue culture: Totipotency of plant tissue; Conservation of plant germplasm; Germplasm preservation-Cryopreservation; Plant Tissue Culture-Sterilization, composition of MS media, Media Preparation; Callus culture, Organogenesis, Somatic embryogenesis, Meristem culture, Haploid production (Anther, Pollen/Ovary, Ovule); Micropropagation, hardening and Green House Technology; Protoplast isolation and fusion- Cybrid Production; Artificial/synthetic seeds; Production of Secondary Metabolites. Genetic engineering in Plants: Agrobacterium-mediated DNA transfer- Ti/Ri plasmid Vectors- Binary and co-integrated vectors; Transformation strategies in plants- Agrobacterium tumefaciens, Physical methods of gene transfer- Electroporation and gene gun methods; Chloroplast transformation; Molecular biology of plant-pathogen interactions and application of gene transfer techniques in pest resistance (Bt genes), edible vaccines, and Delayed fruit ripening; Ethical issues in plant biotechnology. Molecular Markers and Genomics in Plant Breeding- Molecular markers: RFLP, RAPD, AFLP, SSR, SNP, Marker-assisted selection (MAS) in plant breeding, Genomics and transcriptomics in crop improvement, Bioinformatics tools for genome analysis in plants, Case studies: molecular breeding for drought tolerance, disease resistance, and quality traits. Emerging Trends in Plant Biotechnology-Plant synthetic biology, Applications of plant biotechnology in space exploration, Plant-based vaccine production, Epigenetics and gene silencing in plants, Future prospects of plant biotechnology in food security and sustainability

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Department of Biotechnology

Course Code: 24BT2105 Course Title: PROCESS ENGINEERING PRINCIPLES L-T-P-S: 3-0-2-0

Course Objective: The objective of this course is to introduce biotechnology students to the fundamental principles of process engineering as applied to biological systems and bioprocesses. It aims to equip students with the knowledge and skills required to analyze, model, and design unit operations and processes commonly found in biotechnological industries. Emphasis is placed on mass and energy balances, fluid mechanics, heat and mass transfer, and the integration of these concepts in bioprocess applications.

Course Rationale: This course provides a comprehensive introduction to mass and energy balances that are central to process engineering and basic principles for calculation, design, control, safety, optimization, intensification, implementation and sustainability of industrial processes and equipment. More than ever Bio-Engineers need to continue to meet the needs of society and use their process engineering knowledge, which is built from the combination of physics, chemistry, biology, mathematics and economics, and their problem-solving skills, to address global issues related to a growing population, limited resources and climate change.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
Introduction to Biochemical Process Variables and Microbial Composition: Dimensions and units in bioprocesses, Estimation of biomass, substrate, and product concentrations, Measurement of density, specific gravity, and specific volume, Determination of molarity, molality, normality, Analytical techniques for microbial culture composition: spectrophotometry, dry cell weight, and chemical oxygen demand (COD), Volatile Component Analysis in Bioprocesses: Properties of gases and vapours in bioreactors, Ideal gas law and its applications in culture systems, Determination of volatile acids, ethanol, and CO ₂ in microbial processes, Material Balances in Bioreactor Design: Law of conservation of mass, Steady state vs unsteady state systems, Stoichiometry of microbial growth and product formation, Material balances with and without chemical reaction, recycle, bypass, and purge in fermentation systems, Design calculations for batch, fed-batch, and continuous bioreactors, Energy Balances in Bioprocessing: Law of conservation of energy, Heat of reaction, combustion, and formation, Sensible and latent heat, Hess's and Kirchhoff's Law, Heat transfer in bioreactors: cooling and heating during fermentation.	Introduction to Biochemical Process Variables and Microbial Composition: Dimensions and units in bioprocesses, Estimation of biomass, substrate, and product concentrations, Measurement of density, specific gravity, and specific volume, Determination of molarity, molality, normality, Analytical techniques for microbial culture composition: spectrophotometry, dry cell weight, and chemical oxygen demand (COD), Volatile Component Analysis in Bioprocesses: Properties of gases and vapours in bioreactors, Ideal gas law and its applications in culture systems, Determination of volatile acids, ethanol, and CO ₂ in microbial processes, Analytical methods: Gas Chromatography (GC), Titrimetry, Infrared Spectroscopy, Dalton's and Amagat's Laws in gaseous systems, Material Balances in Bioreactor Design: Law of conservation of mass, Steady state vs unsteady state systems, Stoichiometry of microbial growth and product formation, Material balances with and without chemical reaction, recycle, bypass, and purge in fermentation systems, Design calculations for batch, fed-batch, and continuous bioreactors, Energy Balances in Bioprocessing: Law of conservation of energy, Heat of reaction, combustion, and formation, Sensible and latent heat, Hess's and Kirchhoff's Law, Heat transfer in bioreactors: cooling and heating during fermentation, Energy balance in stirred tank bioreactor design

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Department of Biotechnology

Course Code: 24BT2233F

Course Title: GENETICS

L-T-P-S: 2-1-0-0

Course Objective: The primary objective of a **Genetics course** is to equip students with a comprehensive understanding of the principles of heredity, gene structure and function, genetic variation, and the molecular mechanisms that drive inheritance and evolution. This foundational knowledge prepares students for careers and further study in diverse areas of biology, biotechnology, medicine, and agriculture.

Course Rationale: Genetics explores how traits are inherited and how genes affect organism function in health and disease. It is essential for understanding heredity, molecular biology, and modern medicine. This course covers inheritance principles, gene-phenotype relationships, genetic variation, and applications in health, agriculture, industry, and research.

Date of BOS: 12/08/2025

Old Syllabus	Revised Syllabus
PRINCIPLES OF INHERITANCE: Fundamental concepts in Genetics - Overview of genetics (Definition, History of genetics- pre-Mendelian ideas on heredity to emergence of molecular genetics, role of genetics in human welfare). Mendelian inheritance & extension to Mendelian inheritance - Laws of inheritance, Extension to Mendelian inheritance. Non-Allelic Interactions- dominant and recessive epistasis. Patterns of inheritance - Inheritance models in humans (Autosomal, X Linked, Y Linked), Sex-linked inheritance (Sex-limited, linked, and influenced traits), Pedigree Analysis. CHROMOSOMAL THEORY, GENETIC LINKAGE, AND GENE MAPPING: Chromosome Theory of Heredity- Chromosomal basis of Mendel's principles (Morgan's experiment with drosophila). Variation in chromosome number and structure - Chromosome number and types (Autosomes, Sex chromosomes, human karyotype), Numerical variation (Euploidy, Aneuploidy, Polyploidy), Structural variation (deletion, duplication, inversion, translocation, breaks, and its clinical significance). POPULATION GENETICS: Organization of the population, Concepts of a population (gene pool, deme, and panmictic unit), allele and genotype frequencies, Hardy-Weinberg Law- Applications, Establishment of Hardy-Weinberg Law for X- linked genes, Extension of Hardy-Weinberg Law for multiple alleles). Linkage And linkage disequilibrium - (Linkage analysis, Coefficient of linkage disequilibrium, coupling gametes, and repulsion gametes). Genetic and phenotypic variation in a population- (Sources responsible for changes in gene frequencies: Mutation, selection, migration, and isolation; random genetic drift). APPLIED GENETICS: Clinical Genetics - Genetic basis of human diseases (Disease diagnosis, Genetic association studies), Agriculture and Animal Husbandry- Genetics in crop development (Development of disease and stress-resistant crops), Livestock breeding (improving reproductive performance and animal products)	PRINCIPLES OF INHERITANCE: Fundamental concepts in Genetics - Overview of genetics (Definition, History of genetics- pre-Mendelian ideas on heredity to emergence of molecular genetics, role of genetics in human welfare). Mendelian inheritance & extension to Mendelian inheritance - Laws of inheritance, Extension to Mendelian inheritance. Non-Allelic Interactions- dominant and recessive epistasis. Patterns of inheritance - Inheritance models in humans (Autosomal, X Linked, Y Linked), Sex-linked inheritance (Sex-limited, linked, and influenced traits), Pedigree Analysis. CHROMOSOMAL THEORY, GENETIC LINKAGE, AND GENE MAPPING: Chromosome Theory of Heredity- Chromosomal basis of Mendel's principles (Morgan's experiment with drosophila). Variation in chromosome number and structure - Chromosome number and types (Autosomes, Sex chromosomes, human karyotype), Numerical variation (Euploidy, Aneuploidy, Polyploidy), Structural variation (deletion, duplication, inversion, translocation, breaks, and its clinical significance). POPULATION GENETICS: Organization of the population, Concepts of a population (gene pool, deme, and panmictic unit), allele and genotype frequencies, Hardy-Weinberg Law- Applications, Establishment of Hardy-Weinberg Law for X-linked genes, Extension of Hardy-Weinberg Law for multiple alleles). Linkage And linkage disequilibrium - (Linkage analysis, Coefficient of linkage disequilibrium, coupling gametes, and repulsion gametes). Genetic and phenotypic variation in a population- (Sources responsible for changes in gene frequencies: Mutation, selection, migration, and isolation; random genetic drift). APPLIED GENETICS: Clinical Genetics - Genetic basis of human diseases (Disease diagnosis, Genetic association studies), Molecular medicine (Gene therapy, Pharmacogenetics), Genetic testing (Prenatal Genetic testing, DNA fingerprinting), Agriculture and Animal Husbandry- Genetics in crop development, Livestock breeding (improving reproductive performance and animal products)

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Annexure-VIII: Honors, Honors through Innovation (HTI), Honors through Experiential Learning (HTE), and Honors through Research (HTR) courses

Sl No	Elective / Stream	ELECTIVE NUMBER	Course Title	Short Name	L	T	P	S	Cr	CH
1	HONORS	HFC	PERSONALIZED MEDICINE AND GENOMICS	PMG	3	1	0	0	4	4
2	HONORS	HFC	MOLECULAR DIAGNOSTICS	MD	3	1	0	0	4	4
3	HONORS	HFC	VACCINE TECHNOLOGY	VCT	3	1	0	0	4	4
4	HONORS	HFC	BIOENERGY AND RENEWABLE RESOURCES	BRR	3	1	0	0	4	4
5	HONORS	HFC	INDUSTRIAL BIOTECHNOLOGY	IBT	3	1	0	0	4	4
6	HTE	HEC	DEVELOPMENTAL BIOLOGY	DEB	3	1	0	0	4	4
7	HTE	HEC	PHYTOCHEMICALS AND HERBAL PRODUCTS	PHP	3	1	0	0	4	4
8	HTE	HEC	GENOME EDITING	GE	3	1	0	0	4	4
9	HTE	HEC	BIOMIMETICS	BIM	3	1	0	0	4	4
10	HTE	HEC	PLANT CELL BIOPROCESSING	PCB	3	1	0	0	4	4
11	HTI	HIC	ENTREPRENEURIAL TECHNOLOGY DEVELOPMENT AND PROTOTYPING	ETDP	2	0	2	0	3	4
12	HTI	HIC	PROBLEM DEFINITION AND VALIDATION	PDV	2	0	2	0	3	4
13	HTI	HIC	PRODUCT DESIGN AND PROTOTYPE VALIDATION	PDPV	2	0	2	0	3	4
14	HTI	HIC	SCALABLE SOLUTION DEVELOPMENT	SSD	2	0	2	0	3	4
15	HTR	HRC	INDEPENDENT STUDY & RESEARCH	ISR	2	0	2	0	3	4
16	HTR	HRC	RESEARCH METHODOLOGY, ETHICS & SCIENTIFIC RESEARCH	RME SW	2	0	2	0	3	4
17	HTR	HRC	RESEARCH SEMINAR	RS	2	0	2	0	3	4
18	HTR	HRC	TERM PAPER	TP	2	0	2	0	3	4

[Signature]
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Annexure-VIII: Honors, Honors through Innovation (HTI), Honors through Experiential Learning (HTE), and Honors through Research (HTR) courses

Sl No	Elective / Stream	ELECTIVE NUMBER	Course Title	Short Name	L	T	P	S	Cr	CH
1	HONORS	HFC	PERSONALIZED MEDICINE AND GENOMICS	PMG	3	1	0	0	4	4
2	HONORS	HFC	MOLECULAR DIAGNOSTICS	MD	3	1	0	0	4	4
3	HONORS	HFC	VACCINE TECHNOLOGY	VCT	3	1	0	0	4	4
4	HONORS	HFC	BIOENERGY AND RENEWABLE RESOURCES	BRR	3	1	0	0	4	4
5	HONORS	HFC	INDUSTRIAL BIOTECHNOLOGY	IBT	3	1	0	0	4	4
6	HTE	HEC	DEVELOPMENTAL BIOLOGY	DEB	3	1	0	0	4	4
7	HTE	HEC	PHYTOCHEMICALS AND HERBAL PRODUCTS	PHP	3	1	0	0	4	4
8	HTE	HEC	GENOME EDITING	GE	3	1	0	0	4	4
9	HTE	HEC	BIOMIMETICS	BIM	3	1	0	0	4	4
10	HTE	HEC	PLANT CELL BIOPROCESSING	PCB	3	1	0	0	4	4
11	HTI	HIC	ENTREPRENEURIAL TECHNOLOGY DEVELOPMENT AND PROTOTYPING	ETDP	2	0	2	0	3	4
12	HTI	HIC	PROBLEM DEFINITION AND VALIDATION	PDV	2	0	2	0	3	4
13	HTI	HIC	PRODUCT DESIGN AND PROTOTYPE VALIDATION	PDPV	2	0	2	0	3	4
14	HTI	HIC	SCALABLE SOLUTION DEVELOPMENT	SSD	2	0	2	0	3	4
15	HTR	HRC	INDEPENDENT STUDY & RESEARCH	ISR	2	0	2	0	3	4
16	HTR	HRC	RESEARCH METHODOLOGY, ETHICS & SCIENTIFIC RESEARCH	RME SW	2	0	2	0	3	4
17	HTR	HRC	RESEARCH SEMINAR	RS	2	0	2	0	3	4
18	HTR	HRC	TERM PAPER	TP	2	0	2	0	3	4

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